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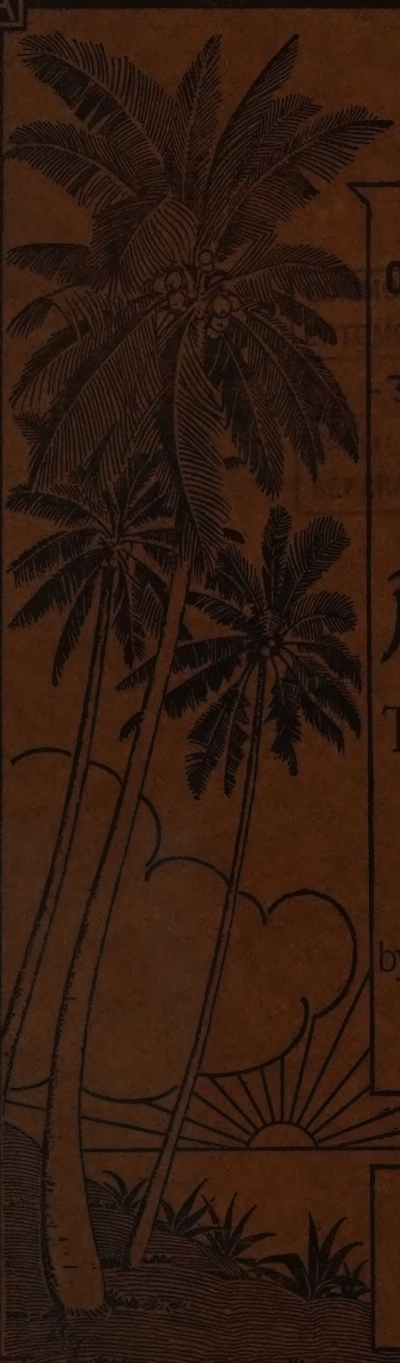

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Page

Editorial: Cocoa Prospects 159

ORIGINAL ARTICLES

Studies in Ceylon Paddies by L. H. Fernando, B.Sc. (Lond.) 162

Preliminary Studies on the Floral Biology of the Coconut Palm by D. V. Liyanage, B.Sc. (Lond.) 171

The Effect of Basin listing on Run-off and Erosion in the Dry Zone of Burma .. 176

DEPARTMENTAL NOTES

Estimates of Acreage and Yields of Paddy in Ceylon 179

SELECTED ARTICLES

Questions and Answers on Ranikhet Disease by P. G. Malkani 180

The Late Sir Frank Stockdale 186

MEETINGS, &c.

The Proceedings of the Meeting of the Central Board of Agriculture held on August 8, 1949 188

Minutes of the 106th Meeting of the Board of Management, Coconut Research Scheme held on December 21, 1949 197

Minutes of the 96th Meeting of the Rubber Research Board 199

Minutes of the 97th Meeting of the Rubber Research Board 201

RETURNS, &c.

Animal Disease Returns, October–December, 1949 203

Meteorological Returns, October–December, 1949 206

The

Tropical Agriculturist

OCTOBER TO DECEMBER, 1949

EDITORIAL

Cocoa Prospects

COCOA appears to have been introduced into Ceylon by the Dutch but there was little extension of the cultivation of this crop until towards the end of the nineteenth century. Lock states that most of the present cocoa seems to have originated from a consignment from Trinindad obtained by Sir R. Horton in 1834-35, and Sessional Paper XLV of 1880 deals with further importations from Trinidad. Dutch introductions had been of the Criollo type. About 1890 Ceylon cocoa was commanding very high prices on the European market where it was considered essential for blending. Even in those days Ceylon cocoa had special characteristics which fitted it for particular markets, as is the case today. By 1932 the acreage had reached 35,000, nearly all in the Kandy and Matale Districts. Low prices in the nineteen-thirties caused some areas to be neglected or replaced by other crops, and these continued in the war years because of lack of shipping space. There was over-production of cocoa in the world before the war, which depressed prices, but the advent of some serious diseases about 1936 has now altered the outlook for the future.

World production of cocoa has been about 700,000 tons a year, of which about half has been from West Africa and a third from Latin America. West African production is almost entirely from small peasant holdings scattered through the Gold Coast, Nigeria, and the Ivory Coast. In the Western Hemisphere the tree is indigenous and is cultivated both in large estates and in peasant holdings. Compared to tea and rubber the proportion of small holdings under cocoa is much larger, except possibly in Ceylon.

In its natural home cocoa has several diseases and pests which are troublesome, particularly Witch Broom Disease, but they are not of such uncontrollability as to threaten extinction of the industry. There are one

or two virus diseases known in cocoa in the West Indies and it is possible one or both of these may exist in Ceylon in a very mild form, perhaps introduced from Trinidad. These virus diseases are quite mild compared to those which have developed during the last 15 years in West Africa. The West African Swollen Shoot Viruses are now known to number 13 types at least. Some are fatal to the tree in about a year while others are of lesser severity or even innocuous. A tree once infected cannot recover and infection by a sub-lethal type does not exclude the possibility of later infections by another, severer type. The spread of these diseases has been very rapid and it is estimated that by now some 46 million trees will have been attacked. The only control measure which is deemed possible is to destroy affected trees as soon as discovered but this has not been effective because of resistance by peasants, who, despite compensation, cannot realize the danger and resent the temporary loss of income.

The viruses are known to be harboured by a number of forest trees, including dadap, from whence the disease probably originated. It is transmitted by certain juice-sucking insects, one of which exists in Ceylon.

In Asia there are so far no pests or diseases of such magnitude as to prevent the profitable cultivation of cocoa. In this we are fortunate compared to the major cocoa-growing areas of the world, but the greatest possible care is necessary to prevent the chance introduction of any of the major troubles. It is furthermore necessary to ensure that the present cocoa plantations are maintained in as high a state of production as possible and that it cease to be regarded as a forest crop which is left to fend for itself.

Research into cocoa improvement is an urgent necessity. The cocoa plant is extremely variable and different varieties cross between themselves so that selected seed does not come true to type and the progeny of any mother tree is a mixture, both in quality of beans and in yielding power. To plant such a mixture means that the future plantation will depend on only a fraction of its trees for the major part of the production, the remainder yielding very little but costing just as much to maintain as the best yielders. The case of tea and rubber, where large acreages are now under mixed types of moderate production capacity whereas they could, but for replanting costs, be under high-yielding clones, should be remembered when new plantings of cocoa are considered. Unfortunately there are not available in Asia any selected high-yielding cocoa clones at present and the dangers inherent in importations are too great, even if countries having good yielding clones were willing to release them to possible rivals in the trade.

Besides yield, the question of quality needs investigation. Ceylon cocoa has special markets, such as the Phillipines, which absorb the highly fermented and artificially dried reddish beans produced here. Even with the best Ceylon curing the mixed produce of our present plantations does not meet the requirements of some buyers, such as those who demand a pure Criollo type, not now to be found unmixed with Forastero or hybirds. A further line of research waiting to be done is on the propagation by vegetative means. The Agricultural Department has been able to obtain 80 per cent. success with rooting cuttings but it is by no means certain that

clones will do best " on their own roots ". Investigations into budding and on stock-scion interactions are required, not omitting the possible use of Alligator (*T. pentagona*) and Monkey (*T. angustifolia*) cocoas as stocks.

Future world markets will depend largely on the success achieved in controlling virus diseases in West Africa and on possible development of new areas in the East. So far as can be foreseen no effective control measure is possible in West Africa other than the long-term one of replanting with virus-resistant clones which have not been discovered yet. Such a discovery is problematical and its use when made will entail a complete renewal of existing trees. World demand for cocoa is steadily rising so that provided a good product acceptable to consumers can be produced there should be no fear of over-production for a good many years to come.

Recent falls in the market price of cocoa seem to have been the result of larger exports from West Africa in 1948 and 1949 but it is doubtful whether these increased exports are really indicative of a permanently increased production from that area. The increase may have been partly due to a favourable season combined with the coming into bearing of new plantings. There is no indication that the ravages of swollen shoot have in any way diminished. It is, however, doubtful whether Ceylon should confine herself in the future only to the special grades hitherto produced. The main world demand is for fully fermented cocoa for which shell colour is less important. Even though the local trade fixes prices largely on appearance, there are other markets in the world which will absorb different grades less troublesome to prepare. Some research into curing and marketing of such grades appears necessary.

Studies In Ceylon Paddies

1. Investigations on varieties grown in the Hambantota District —

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AGRICULTURAL RESEARCH OFFICER

INTRODUCTION

THE varieties of paddy grown in the Hambantota District take three to four months from sowing to harvest. The same varieties are sown in the two seasons, *maha* and *yala*. *Maha* sowings are done in November-December, and *yala* sowings in May-June. This paper presents the results of investigations on paddies which take eleven to thirteen weeks from sowing to flowering, viz., *Rathkarayal*, *Sinnanayan*, and *Suduheenati*. Pure-line selections of *Rathkarayal* and *Sinnanayan* were made by Mr. G. V. Wickremasekera, Paddy Officer, in 1938 : these were 3753 and 3777 in *Rathkarayal;* 2208 and 398 in *Sinnanayan*. The *Suduheenati* selections were ICPY-15 and Hf 9, and were made by Lord in the Central Province.

DESCRIPTION OF VARIETIES UNDER TEST

Descriptions of Ceylon Paddies are available only of a few recommended pure-lines. These descriptions are of qualitative characters, mainly pigmentation. Grain size determinations of some pure-lines were made by Lord in 1929.

Anthocyanin pigment.—Differences, though not pronounced, are found between varieties, and even between strains of the same variety, in the intensity and distribution of anthocyanin pigment. *Rathkarayal* and *Sinnanayan* have anthocyanin in the leaf sheath, stigma and apiculus; the *Suduheenati* selections, ICPY-15 and Hf 9, lack anthocyanin pigment. In grain colour, *Suduheenati* Hf 9 is pale straw; the others, viz., *Suduheenati* ICPY-15, *Rathkarayal* and *Sinnayayan* have dark brown furrows and lighter ridges. Like most varieties of Ceylon Paddy, *Rathkarayal*, *Sinnanayan* and *Suduheenati* have a red pericarp.

Grain size.—Grain size determinations of the six selections, *Rathkarayal* 3753 and 3777, *Suduheenati* Hf 9 and ICPY-15, and *Sinnanayan* 2208 and 398, were made. The length, breadth and thickness of two hundred grains of each selection were first measured. These same grains were then carefully husked and the length, breadth and thickness of the two hundred husked grains (rice) were recorded. The means and standard errors of length, breadth and thickness of unhusked grain are given in Table I, and of husked grain in Table II. With a standard error of 0·025 mm. and less, a difference between means greater than 0·07 mm. is significant; with a standard error of 0·01 mm. and less, the significant difference between means is 0·03 mm. Applying these critical differences to the differences between mean grain dimensions, it is possible to distinguish between varieties, and even between strains of the same variety.

Table I—Dimensions of Paddy (Unhusked Grain)

Variety	Length				Breadth				Thickness			
	Mean (mm.)	Range		Standard Error of the Mean	Mean (mm.)	Range		Standard Error of the Mean	Mean (mm.)	Range		Standard Error of the Mean
		Lowest	Highest			Lowest	Highest			Lowest	Highest	
Sinnanayan 2208	7·76	6·8	8·4	0·0165	3·41	3·1	3·9	0·0098	2·29	1·9	2·8	0·0088
Sinnanayan 398	8·13	7·2	9·0	0·0219	3·30	2·7	3·7	0·0117	2·26	1·6	2·6	0·0096
Rathkarayal 3753	7·99	7·0	9·0	0·0263	3·14	2·8	3·5	0·0089	2·23	2·0	2·5	0·0068
Rathkarayal 3777	8·18	7·1	8·8	0·0190	3·22	2·7	3·6	0·0098	2·24	1·8	2·5	0·0068
Suduheenati ICPY 15	8·43	7·1	9·5	0·0248	3·22	2·9	3·7	0·0103	2·16	1·8	2·5	0·0076
Suduheenati Hf 9	8·00	7·2	8·9	0·0213	3·34	2·9	3·6	0·0106	2·27	2·0	2·5	0·0077

Table II—Dimensions of Rice (Unhusked Grain)

Variety	Length				Breadth				Thickness			
	Mean (mm.)	Range		Standard Error of the Mean	Mean (mm.)	Range		Standard Error of the Mean	Mean (mm.)	Range		Standard Error of the Mean
		Lowest	Highest			Lowest	Highest			Lowest	Highest	
Sinnanayan 2208	5·48	5·1	5·9	0·0181	2·94	2·2	3·2	0·0092	2·06	1·7	2·3	0·0073
Sinnanayan 398	5·64	4·9	6·6	0·0179	2·74	2·1	3·1	0·0137	2·05	1·5	2·4	0·0099
Rathkarayal 3753	5·72	5·0	7·4	0·0209	2·70	2·1	3·0	0·0122	2·03	1·7	2·3	0·0069
Rathkarayal 3777	5·81	4·9	7·0	0·0155	2·80	2·4	3·1	0·0101	2·04	1·8	2·3	0·0057
Suduheenati ICPY 15	5·94	5·1	7·0	0·0146	2·68	1·8	3·2	0·0124	1·95	1·5	2·2	0·0075
Suduheenati Hf 9	5·60	5·0	8·2	0·0185	2·91	2·4	3·1	0·0108	2·07	1·7	2·3	0·0078

Flowering.—The interval between sowing and flowering for each of the varieties is indicated in Table III. All varieties took less time to flower in *maha* than in *yala*, and this may be a photoperiodic response to the shorter day length in *maha*. The number of days from sowing to flowering has been consistently less in *maha* than in *yala*, for all varieties. The difference in the age of each variety in *maha* and *yala* is indicated in Table IV. This difference was more in some varieties than in others, but in all varieties the difference between *yala* and *maha* age was significant.

Table III—Age of Varieties from Sowing to Flowering expressed in Days

	Rathkarayal			*Suduheenati*		*Sinnanayan*		
	3753	*3777*	*Local*	*Hf 9*	*ICPY 15*	*2208*	*398*	*Local*
Ambalantota—								
Yala, 1945	90	86	86	86	91	86	86	86
Yala, 1946	91	92	91	91	95	92	91	91
Yala, 1947	83	83	89	89	91	84	88	85
Tissamaharama—								
Yala, 1945	84	84	84	84	88	84	84	84
Yala, 1946	91	84	84	91	91	84	91	91
Yala, 1947	87	82	82	85	87	82	87	82
MEAN (YALA)	88	85	86	88	90	85	88	86
Ambalantota—								
Maha, 1945–46	80	80	80	80	80	80	86	80
Maha, 1946–47	80	77	74	77	79	74	87	79
Maha, 1947–48	79	68	70	71	72	71	79	71
Tissamaharama—								
Maha, 1945–46	80	78	80	78	79	79	82	79
Maha, 1946–47	79	77	77	77	77	77	81	77
Maha, 1947–48	76	69	69	72	69	72	76	69
MEAN (MAHA)	79	75	75	76	76	75	82	75

Table IV—Age Difference in Yala and Maha expressed in Days

Varieties	*Mean Age*		*Difference in mean age between Yala and Maha*	*Standard Error of the difference in mean ages*	*Significant difference (5% Point)*
	Yala	*Maha*			
Rathkarayal 3753	88	79	9	1·58	3·50
Rathkarayal 3777	85	75	10	2·52	5·59
Rathkarayal local	86	75	11	2·40	5·32
Suduheenati Hf 9	88	76	12	1·92	4·26
Suduheenati ICPY 15	90	76	14	2·16	4·79
Sinnanayan 2208	85	75	10	2·09	4·63
Sinnanayan 398	88	82	6	1·78	3·95
Sinnanayan local	86	75	11	2·46	5·46

DESIGN OF FIELD EXPERIMENTS

The six selections already mentioned and the unselected *Rathkarayal* and *Sinnanayan* from cultivator's fields were compared in variety trials set down at the Ambalantota and Tissamaharama Paddy Stations. The trials commenced in the *yala* season of 1945 and continued over the *maha* and *yala* seasons of three years, viz., 1945, 1946 and 1947.

The design of the experiment was a randomized block replicated four times at each station. The eight strains were represented by eight plots, one for each, arranged in a block which measured 47 feet by 112 feet. The individual plots were 47 feet by 14 feet; a border of one foot around each plot was discarded at harvest; yields were recorded of a 45 feet by 12 feet plot, which in extent was 1/80 acre.

All varieties were sown and not transplanted. No fertilizers were applied. Intercultivation and weeding were not done. The plots were kept almost weed free by regulation of irrigation water.

RESULTS AND DISCUSSION

The thirty-two plots at each station made 384 plots in all at the two stations, in the two seasons of three years. The total variation between the 384 plots was analysed into components due to varieties, stations, seasons, years, and the first, second and third-order interactions of these main effects. The variation between the 48 blocks included the variation due to stations, seasons, years, and their interactions. In computing the block sum of squares, the sums of squares due to stations, seasons, years, and their interactions were deducted from the total sum of squares between blocks. The mean squares for varieties, stations, seasons, years, and all interactions, except varieties x stations x years and varieties x seasons x years, were significant at the 1 per cent. point. The standard error of a single plot was 2.73 and the coefficient of variability 8.6 per cent. Significant differences within main effects and interactions were determined at the 5 per cent. point of probability.

Table V—Analysis of Variance of Yield in Pounds

	Degrees of Freedom	*Sum of Squares*	*Mean Square*	*Variance Ratio*	*5 Per Cent. Point*	*1 Per Cent. Point*
Stations	1	5,593·71	5,593·71	751·84	3·89	6·76
Seasons	1	189·84	189·84	25·51	3·89	6·76
Years	2	1,580·55	790·27	106·21	3·04	4·71
Stations x Seasons	1	3,175·15	3,175·15	426·76	3·89	6·76
Stations x Years	2	425·07	212·53	28·56	3·04	4·71
Seasons x Years	2	6,844·44	3,422·22	459·97	3·04	4·71
Stations x Seasons x Years	2	5,527·65	2,763·82	371·48	3·04	4·71
Varieties	7	700·35	100·05	13·44	2·05	2·73
Varieties x Stations	7	141·29	20·18	2·71	2·05	2·73
Varieties x Seasons	7	243·93	34·84	4·68	2·05	2·73
Varieties x Years	14	276·30	19·73	2·65	1·74	2·17
Varieties x Stations x Seasons	7	139·34	19·90	2·67	2·05	2·73
Varieties x Stations x Years	14	156·42	11·17	1·50	1·74	2·17
Varieties x Seasons x Years	14	161·18	11·51	1·54	1·74	2·17
Varieties x Stations x Seasons x Years	14	242·33	17·30	2·32	1·74	2·17
Blocks	36	1,531·72	42·54	5·71		
Error	252	1,876·78	7·44			
Total	383	28,806·05				

Table VI—Variety Yields (Totals of both stations)

Varieties	*Total yield of 48 plots, each of 1/80 acre (pounds)*	*Yield per acre in pounds*	*Yield per acre in bushels (calculated at an average bushel weight of 48 pounds)*
Rathkarayal 3753	1556·2	2593·6	54·0
Rathkarayal 3777	1475·8	2459·6	51·2
Rathkarayal local	1406·6	2344·3	48·8
Suduheenati Hf 9	1473·6	2456·0	51·1
Suduheenati ICPY 15	1636·2	2727·0	56·8
Sinnanayan 2208	1526·1	2543·5	53·0
Sinnanayan 398	1533·3	2555·5	53·2
Sinnanayan local	1560·4	2600·6	54·1

Significant between the totals of 48 plots = 53·9 pounds

Table VII—Interaction of Varieties x Seasons and Varieties x Stations

(*Yields are totals of 24 plots, expressed in pounds*)

	Seasons		*Stations*	
Varieties	*Maha*	*Yala*	*Tissamaharama*	*Ambalantota*
Rathkarayal 3753	817·1	739·1	677·6	878·6
Rathkarayal 3777	733·0	742·8	661·3	814·5
Rathkarayal local	703·9	702·7	614·5	729·1
Suduheenati Hf 9	754·3	719·3	665·3	808·3
Suduheenati ICPY 15	826·0	810·2	697·4	938·8
Sinnanayan 2208	758·7	767·4	676·7	849·4
Sinnanayan 398	814·4	718·9	665·7	867·6
Sinnanayan local	811·7	748·7	692·8	867·6

Significant difference between the totals of 24 plots = 37·41 pounds

Table VIII—Interaction of Varieties x Stations x Seasons

(*Yields are totals of 12 plots expressed in pounds*)

	Ambalantota		*Tissamaharama*	
Varieties	*Maha*	*Yala*	*Maha*	*Yala*
Rathkarayal 3753	487·9	390·7	329·2	348·4
Rathkarayal 3777	450·5	364·0	282·5	378·8
Rathkarayal local	431·1	361·0	272·8	341·7
Suduheenati Hf 9	449·7	358·6	304·6	360·7
Suduheenati ICPY 15	495·0	443·8	331·0	366·4
Sinnanayan 2208	466·0	383·4	292·7	384·0
Sinnanayan 398	491·1	376·5	323·3	342·4
Sinnanayan local	480·7	386·9	331·0	361·8

Significant difference between the totals of 12 plots = 26·45 pounds

Varieties.—In the comparison of total yields of varieties over all stations, seasons and years, *Suduheenati* ICPY-15 was significantly superior to all other varieties (Table VI). The comparison of variety yields in each season and at each station (Table VII), indicates *Suduheenati* ICPY-15 as the highest yielder, but significant superiority over all other varieties was obtained only in the *yala* season, and at Ambalantota. The interaction of varieties into stations into seasons is presented in Table VIII : *Suduheenati* ICPY-15 was significantly better than all other varieties in *yala* at Ambalantota; in *maha*, at Ambalantota, *Suduheenati* ICPY-15 was still the highest yielder, but did not differ significantly from *Rathkarayal* 3753, *Sinnanayan* 398 and *Sinnanayan* local. At Tissamaharama, in *maha*, *Suduheenati* ICPY-15 was equal in yield to *Sinnanayan* local, and these two were the highest yielders; they were not significantly better than *Rathkarayal* 3753 and *Sinnanayan* 398. In *yala*, at Tissamaharama, *Sinnanayan* 2208 was the highest yielder, but was not significantly different from *Sinnanayan* local, *Suduheenati* ICPY-15, *Suduheenati* Hf 9 and *Rathkarayal* 3777.

A comparison of selections against unselected local material (Table VIII) indicates that the *Sinnanayan* selections were not significantly superior to *Sinnanayan* local in any season or station. *Sinnanayan* 398 yielded higher than 2208 in *maha*, and 2208 more than 398 in *yala*. These differences were significant at Tissamaharama. The two *Sinnanayan* selections show differences in habit; 2208 grows tall and has erect tillers; 398 is not tall and has a wide tillering angle. 2208 lodges, particularly in *maha;* when it does not lodge, as in *yala* at Tissamaharama, it yields significantly more than 398. Similar differences in respect of habit and lodging were observed between *Rathkarayal* 3753 and 3777. *Rathkarayal* 3777 grows taller than 3753 and lodges badly, but when it does not lodge, as in *yala* at Tissamaharama, it yields significantly more than 3753. In the *maha* season at Tissamaharama 3753 is significantly better. At Ambalantota, 3753 is significantly better both in *maha* and *yala*. *Suduheenati* ICPY-15 always yielded higher than *Suduheenati* Hf 9; this was significantly so, except in the *yala* season at Tissamaharama.

The only non-significant interactions were varieties into stations into years, and varieties into seasons into years. The interpretation would be that the three years had no differential effect on the two significant first-order interactions, varieties into stations and varieties into seasons. The effects, already discussed, of stations and seasons on varieties are therefore taken to be similar in all years.

Stations and Seasons.—The difference in yields between stations and between seasons is highly significant : the yield at Ambalantota was higher than that at Tissamaharama; the yield in the *maha* season was higher than in the *yala* season (Table IX). These significant differences between the main effects of stations and seasons should be interpreted in relation to the significant interaction of stations into seasons : at Ambalantota, the *maha* season was significantly better than the *yala* season; at Tissamaharama, the *yala* season was significantly better than the *maha* season.

Table IX—Interaction of Stations x Seasons

(Yields for each station x season are totals of 96 plots in pounds ; Yield totals for each station and for each season are of 192 plots)

Stations	Seasons		
	Maha	*Yala*	*Total*
Tissamaharama	2467·1	2884·2	5351·3
Ambalantota	3752·0	3064·9	6816·9
	6219·1	5949·1	12168·2

Significant difference between totals of 96 plots = 74·82 pounds

Significant difference between totals of 192 plots = 105·80 pounds

Table X—Maha and Yala Acre-Yields at Ambalantota and Tissamaharama (Calculated from Table IX)

Station	*Season*	*Yield per Acre*	
		Pounds	*Bushels*
Ambalantota	Maha	3126·6	65·1
	Yala	2554·0	53·2
Tissamaharama	Maha	2055·9	42·8
	Yala	2403·5	50·0

The differences in soil at the two stations provide a possible explanation for the observed differences in yield. The Tissamaharama soil is a grey-brown loam, somewhat on the light side, with a pH. of 7.23. Its salt content is low, viz., 0·045 per cent. Its base exchange capacity and power of regeneration are lower than that of Ambalantota. It is poor in both available potash and phosphoric acid. The Ambalantota soil is a heavy brown loam of pH 7·00, slightly saline, but becoming more markedly saline (nearly 0·28 per cent. salt) in dry weather. During the *yala* season, the increasing concentrations of salts may have a slightly depressant effect on yield. The available potash content of the soil is low, but it is moderately rich in phosphoric acid.

Table XI gives the monthly rainfall at the two stations, Ambalantota and Tissamaharama. It will be seen that the rainfall in *yala* was much less than in *maha*. The low rainfall in *yala*, while increasing soil salinity at Ambalantota and depressing yields, provided more favourable conditions during sowing, growth, and flowering. This would explain the higher yield in *yala* over *maha* at Tissamaharama. At Ambalantota, however, it would appear that yields depended more on the degree of soil salinity than on other factors. Soil fertility would account for the higher yields of Ambalantota over Tissamaharama in both *maha* and *yala*.

Table XI—Rainfall in inches at Ambalantota and Tissamaharama

	Ambalantota				*Tissamaharama*			
	1945	*1946*	*1947*	*1948*	*1945*	*1946*	*1947*	*1948*
January ..	0·29..	0·29..	2·26..	2·26..	0·63..	1·50..	4·12..	6·13
February ..	1·02..	0·41..	0·20..	0·30..	1·62..	1·10..	0·29..	nil
March ..	5·88..	3·90..	3·14..	0·78..	7·02..	4·48..	7·27..	1·02
April ..	5·48..	4·67..	2·68..	3·80..	4·06..	5·45..	4·47..	2·81
May ..	0·97..	0·81..	8·98..	1·40..	0·74..	nil ..	4·72..	1·20
June ..	5·19..	1·46..	7·68..	2·44..	1·43..	1·41..	4·12..	1·26
July ..	1·42..	0·67..	0·31..	0·65..	1·57..	nil ..	0·15..	0·42
August ..	0·69..	1·25..	4·51..	0·67..	nil ..	nil ..	1·63..	1·44
September ..	0·78..	1·50..	0·85..	2·47..	nil ..	0·23..	0·45..	0·43
October ..	5·13..	12·16..	6·11..	9·28..	6·13..	8·82..	7·30..	4·59
November ..	13·80..	10·26..	6·05..	11·09..	10·09..	10·99..	12·58..	6·46
December ..	0·67..	7·29..	4·58..	8·49..	5·34..	3·73..	3·93..	3.96
Total ..	41·32	44·67	47·45	44·19	39.63	37·71	51·03	29·72

Years.—The significant difference between the yields of any two of the three years at each of the stations indicates the expected variation in yield from year to year. (Table XII.) Variation in environmental factors, such as rainfall, and the incidence of pests and diseases can account for these differences. No attempt is however made in this paper to relate yield differences to differences in the environmental factors of the three years.

Table XII—Interactions of Stations x Years

(*Yields for each station x year are totals of 64 plots in pounds ; yields for each year are totals of 128 plots*)

	Years		
	1945–46	*1946–47*	*1947–48*
Tissamaharama ..	1831·3 ..	1590·9 ..	1929·1
Ambalantota ..	2470·0 ..	2105·8 ..	2241·1
	4301·3	3696·7	4170·2

Significant difference between totals of 64 plots = 61·09 pounds
Significant differences between totals of 128 plots = 86·40 pounds

SUMMARY

1. Grain size determinations have been used for distinguishing varieties and strains of varieties. Differences in grain size between varieties and strains of varieties were significant.

2. The earlier flowering of short-aged paddies in *maha* than in *yala* is possibly a photoperiodic response to a shorter day length in the *maha* season.

3. Variety tests at Ambalantota and Tissamaharama over the *maha* and *yala* seasons of three years indicate *Suduheenati* ICPY-15 as the best of the $3\frac{1}{2}$ months paddies cultivated in the Hambantota District.

4. The yields at Ambalantota are higher than at Tissamaharama, the difference being attributed to higher soil fertility at Ambalantota.

5. At Tissamaharama, higher yields are obtained in *yala* than in *maha*, but at Ambalantota the yields are higher in *maha*. The *yala* season with its lower rainfall provides conditions more favourable for growth and production, but on slightly saline soil at Ambalantota, increasing concentrations of salts in dry weather (*yala*) may have a depressant effect on yield.

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Preliminary Studies on the Floral Biology of the Coconut Palm

BY

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THE floral biology of the coconut palm (Cocos nucifera Linn.) appears to have received but scant attention. Considering its importance, the literature pertaining to the several aspects of the palm must be regarded as meagre. The earliest papers dealing with some observations on floral biology of this palm are those of Aldaba (1921)[1] and Furtardo (1923)[2]. Marechal (1928)[3] has made more or less a complete investigation of the dwarf palm. Some information regarding the tall variety is contained in Patel's[4] monograph.

It is considered desirable to make not only detailed observations on the commonly grown tall variety of Ceylon but also to make a comparative study with reference to the other varieties, principally dwarf and King coconut. A systematic classification of the varieties of coconut grown in Ceylon has not been done. Hence a few notes on the varieties mentioned herein are desirable. The tall variety referred to is the palm commonly grown on a commercial scale in this Island. The palm takes 6 to 7 years to flower and remains productive for over 70 years. The dwarf is of Malayan origin, short in habit, and first flowers in $3\frac{1}{2}$ to $4\frac{1}{2}$ years. The economical life time does not last more than 30 years. Here three forms can be distinguished mainly by the colour of the epicarp of the nut : green, ivory yellow and golden yellow. The King coconut palm is rather tall in habit and is less short lived than the tall variety. The epicarp of the nut is golden yellow in colour. Locally this variety is referred to as " Thembili ". Observations which follow are confined to the following aspects of floral biology :—

1. The duration of the two sexual phases with special reference to their synchrony. This was expected to throw light on the fact whether a particular variety could or could not be self-pollinated.
2. Studies on the viability of pollen with special reference to atmospheric humidity.

Floral Structure.—The number and arrangement of the floral parts in the different varieties of coconut commonly grown in Ceylon are more or less identical. They conform to the usual trimerous pattern of floral construction which is the common feature of all monocotyledons.

The Male and Female phases.—The duration of the female phase is herein computed on the basis of the stigmas Receptivity begins when the three stigmas separate and a fluid is secreted through them. At this stage the stigmas and the upper area of the visible portion of the ovary are

whitish. The first signs of the loss of receptivity are the change in colour undergone by the stigmas from a whitish to a brownish shade; simultaneously the exudation of the fluid ceases. The duration of the male phase is taken as that period from the opening of the first male flower to that of the last within a spadix. These phases are represented in Table I.

TABLE I.—Duration of the Male and Female Phases

Variety	*Palm No.*	*Male phase No. of days*	*Female phase No. of days*
Tall palms	195 ..	19 ..	7
	292 ..	21 ..	6
	163 ..	18 ..	5
	204 ..	20 ..	5
Dwarf	488 ..	18 ..	10
	2649 ..	22 ..	14
	2647 ..	22 ..	15
King Coconut	2605 ..	20 ..	16
	494 ..	18 ..	14

In all the three varieties examined the male phase lasted from 18 to 22 days. Often male flowers do not remain on the inflorescence for more than one day; generally the male flowers open in the early hours of the day and are shed the same evening. There is no definite sequence of the opening of male flowers. Those that are borne on the upper half of each spikelet open earlier than those on the lower half. In the tall palms a few male flowers always open soon after the opening of the spathe, but in dwarf and King coconut instances have occurred when the first flower bloomed only after a week of the opening of the spathe.

The female phase lasts from 5 to 7 days in tall palms and from 10 to 16 days in dwarfs and King coconuts. In the tall palms, the male phase always precedes the female phase and very often there is an interval of about one to two days between the two phases. Thus there can be no self-pollination between the male and female flowers of each spadix in the tall palms. In all the observations, only one spathe opened before the completion of the female phase of the previous inflorescence of the same palm. Here again the female flowers were receptive only for one day, after the opening of the new spathe. Chances of inter-spadix pollination in tall palms are therefore rather remote and cross pollination is the general rule. In the dwarfs and King coconuts, the male and female phases overlap and consequently self-pollination is considerable. In dwarf palms the female phase begins about a week after the start of the male phase and ends near the completion of the male phase. Marechal working on Malayan dwarfs in Fiji has made similar observations.

The receptive period of individual female flowers of dwarf, King coconut and tall palms varies from two to four days. Here again there is no definite order in which they become receptive. Table II presents the duration of receptivity of individual female flowers on an inflorescence of the tall variety. The spikelets and the female flowers are numbered from the base upwards.

TABLE II.—The Period of Receptivity of Female Flowers of a Spadix from a Tall Variety Coconut Palm

No. of Spikelet	*No. of Female Flower*	*Period of Receptivity*	*No. of Spikelet*	*No. of Female Flower*	*Period of Receptivity*
1	1	3 days	13	1	2 days
	2	2 „		2	2 „
	3	Fallen	14	1	3 „
	4	Fallen	15	1	3 „
	5	Fallen	16	1	2 „
	6	Fallen		2	2 „
2	1	2 days		3	2 „
3	1	4 „		4	Fallen
4	1	Fallen	17	1	3 days
5	1	„	18	1	2 „
6	1	3 days	19	1	2 „
	2	3 „	20	1	2 „
7	1	3 „		2	Fallen
8	1	3 „		3	„
9	1	Fallen		4	2 days
	2	2 days	21	1	2 „
10	1	Fallen	22	1	not developing
11	1	3 days	23	—	
	2	3 „	24	1	2 days
	3	3 „		2	Fallen
	4	Fallen	25	1	„
	5	3 days	26	1	2 days
12	1	3 „	27	1	3 „
	2	Fallen	28	1	2 „
			29	1	Fallen

Germination of pollen grains.—Tests were carried out to determine a suitable medium for the germination of pollen grains. Sugar and gelatine were used in different concentrations. Results are tabulated in Table III.

TABLE III.—Percentage of Germination of Pollen Grains

Time	*Dwarf Pollen*			*Tall Palm Pollen*		
	A	*B*	*C*	*A*	*B*	*C*
A. After 30 mins	0	0	0	30	32	0
B. After one hour	26	58	0	62	74	0
C. After two hours	38	53	0	56	75	0

A .... 5 per cent. Sugar + 2 per cent. gelatine
B .... 10 per cent. Sugar + 2 per cent. gelatine
C .... 15 per cent. Sugar + 2 per cent. gelatine

The intine protrudes through the rupture of the exine within half an hour after the pollen grains are left in a culture solution. Maximum germination is effected by the end of the first hour and thereafter the pollen tubes continue to elongate. For maximum germination 10 per cent. sugar plus 2 per cent. gelatine appears to be the best. In the higher concentrations of sugar, the cytoplasm of the pollen grain is plasmolised and germination was almost nil. Marechal has obtained contrary results and has indicated that

25 per cent. saccharose showed 60 per cent. germination. In the 10 per cent. sugar plus 2 per cent. gelatine solution there was 58 per cent. germination of dwarf pollen and 74 per cent. germination of pollen from tall variety palms.

Preservation of pollen.—Pollen retains its vitality, under atmospheric conditions, only for about 3 to 5 days. In the hybridisation work connected with coconut palms, it was found necessary to keep the pollen viable sometimes even up to 10 days. Relative humidity of the atmosphere is a factor that changes constantly. Robert E. Wilson[5] has shown that different humidity equilibria can be produced by using various sulphuric acid solutions, in enclosed chambers.

Three desiccators were used with 18·5 per cent., 30·4 per cent. and 43·4 per cent. H_2SO_4; the relative humidity inside these chambers remained at a constant level of 90 per cent., 75 per cent., and 50 per cent. respectively. Fresh pollen collected from dwarf and tall variety palms were kept in the three desiccators. Germination counts were made every other day after allowing the pollen to germinate in a 10 per cent. sugar plus 2 per cent. gelatine solution. The results are given in Table IV.

TABLE IV.—Percentage of Germination of Pollen Grains kept in Desiccators with varying Concentrations of Sulphuric Acid

Age of pollen grains in days	*Tall palm pollen* — *Percentage of Germinations*			*Dwarf palm pollen* — *Percentage of Germinations*		
	90 per cent. R. H.	*75 per cent. R. H.*	*50 per cent. R. H.*	*90 per cent. R. H.*	*75 per cent. R. H.*	*50 per cent. R. H.*
2	58·5	59·4	54·2	38·6	51·4	59·8
3	15·6	41·7	56·4	9·6	38·9	46·8
5	—	50·6	43·4	—	48·7	48·9
7	—	61·6	59·7	—	52·1	40·0
8	—	42·9	71·8	—	20·6	36·2
10	—	36·1	56·7	—	19·2	40·5
12	—	8·3	67·0	—	5·6	46·0
14	—	—	44·9	—	—	20·4
16	—	—	44·2	—	—	36·0
19	—	—	40·6	—	—	9·9
21	—	—	20·6	—	—	—
24	—	—	5·8	—	—	—

On the fifth day of storage, pollen kept in the desiccator with 90 per cent. relative humidity, showed no germination. Therefore a saturated atmosphere seems to be injurious to the viability of pollen grains of coconut palms. On the other hand 40 per cent. of the pollen grains from tall palms remained viable for 19 days when kept in a desiccator with 50 per cent. R. H. Dwarf pollen is relatively more short lived and after the 7th day of storage less than 40 per cent. of the pollen grains were viable even in the 50 per cent. R. H. level. Marechal has obtained similar results and claims that 50 per cent. H_2SO_4 maintained a higher germination percentage. Tests were carried out with pollen grains stored over calcium chloride, but here pollen was more short-lived than under atmospheric conditions.

SUMMARY

1. The tall variety palms are protandrous. Interspadix pollination is rather remote. They are generally cross-pollinated.

2. In the dwarf and King coconut palms, male and female phases overlap and self-pollination is the general rule.

3. 10 per cent. cane sugar plus 2 per cent. gelatine is a favourable medium for the germination of pollen grains.

4. The viability of the pollen grains can be prolonged by storing them in a desiccator with 43·4 per cent. H_2SO_4.

5. A saturated atmosphere seems to be injurious to the viability of pollen grains of coconut palms.

ACKNOWLEDGMENT

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The Effect of Basin Listing on Run-off and Erosion in the Dry Zone of Burma

BY

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THERE is a dearth of information on the quantities of surface run-off and soil erosion in Asia. The present small experiment which was carried out in Central Burma is now reported because it provides some data which, though not directly applicable to Ceylon, are indicative of the quantities of soil which may be lost under different systems of tillage. The writer has reason for thinking that the original records of this experiment have been lost and as-there is particular interest at present in information of this kind the experiment is briefly recorded. The soils of the Dry Zone of Central Burma are calcareous loams often having a fairly high proportion of sand. They erode easily but not so easily as some of the non-lateritic soils of the Dry Zone of Ceylon. The land is mainly undulating, slopes up to 5 : 100 being common and sometimes twice as steep. The rainfall is 30 to 35 inches, nearly all falling between April and early November, the precipitation being characterized by its irregular distribution, frequent violent down-pours occurring which cause much sheet erosion. A drought is frequent lasting three to six weeks in July and early August, so that conservation of soil moisture is an essential of good husbandry as well as anti-erosion measures to cope with the heavy rains of late August and September.

The crops grown are cotton, beans, sesamum, sorghum and groundnut, all line sown and intercultivated with bullock-drawn implements. Early trials with various methods of tillage and intercultivation had indicated that the use of basin listing greatly reduced run-off and soil losses. The making of tie-ridges with intercultivation implements is simple. It is only necessary to raise the implement by its handle-bars at suitable intervals (generally 6 to 8 feet), so leaving a small ridge of soil across the furrow. The tie-ridges should be staggered in adjacent rows. This simple method of basin listing was found to be very effective in holding up water and checking soil loss. Though the method had been widely accepted as beneficial there was no precise data on its effectiveness until the experiment recorded below was carried out. This experiment was done by the late H. F. Robertson in 1940 and 1941, after which the war stopped it.

The experiment consisted of seven plots of 18 × 4 feet on a slope of 6 in 100. The soil was Mahlaing Farm Upland, a very friable sandy loam with numerous calcareous nodules. At the lower end of each plot a tank

was sunk into the ground with arrangements for collecting the run-off water and eroded soil. The treatments were as follows :—

1. Fallow uncultivated. Ground left untouched and weeds (mostly grasses) allowed to grow. The soil surface became compacted and held by the fibrous roots of the weeds.
2. Fallow cultivated ... Cultivated with a *pauktu* (a heavy hoe) frequently and after each cultivation harrowed with a Burmese-type wooden-toothed harrow into low ridges diagonally across the slope. Cultivation was done after each fall of rain which was enough to pack the surface layer. Weeds were not allowed to develop.
3. Basin listed ... Hand cultivated into ridges such as would be raised at the final cultivation of cotton and tie-ridges were put in. Cultivation was done at irregular intervals after rain and tie-ridges were then re-made. Few weeds developed.
4. Cotton repeated ... Cotton was grown each year with the normal cultivation ending with basin listing. Cotton sown in squares with ridges across the slope.
5. Cotton rotated ... Cotton grown in the first year as in 4. Second year sesamum in the early rains followed by beans (*Phaseolus lunatus* Linn.) in the late rains (sown late August or early September). Normal sesamum cultivation in lines across the slope without basin listing and ridges low as raised by normal harrowing.
6. Sesamum repeated .. Sesamum followed by beans in the late rains as in the second year of 5, repeated each year.
7. Sesamum rotated ... First year sesamum as in the first year of 6 (and second year of 5) followed by beans in the late rains. Second year cotton as in 4. This treatment is the same as 5 but reversed.

With this arrangement there were two cotton plots and two sesamum plus beans plots in each year, in 1940, Nos. 4 and 5 being cotton and Nos. 6 and 7 sesamum followed by late rains beans while in 1941 Nos. 4 and 7 carried cotton and Nos. 5 and 6 sesamum plus beans. Measurements of surface run-off and of surface-eroded soil were made whenever necessary. Only rain of considerable intensity caused any erosion. Combining the figures for both years the quantities of water and soil collected are given in Table I in tons per acre.

TABLE I

Quantities of Run-off Water and Eroded Soil in Tons per Acre. 1940 and 1941 combined

Treatment	*Tons of run-off water per acre*	*Tons of eroded soil per acre*
1. Fallow uncultivated	742 ..	6·4
2. Fallow cultivated	1119 ..	22·1
3. Basin listed	363 ..	12·7
4. Cotton with basin listing at last intercultivation	574* ..	11·1*
5. Sesamum followed by beans (Harrow-ridged but not basin listed)	1091* ..	31·0*

*Total of four plots (2 for each year) divided by 2.

The effect of uncultivated fallow with weed growth in preventing soil loss is clear but it allowed a good deal of water to run off. Cultivated fallow caused heavy loss of soil and with it went a lot of water. Sesamum followed by beans (the beans developing after most of the monsoon was over) was equally bad, if not worse. The two basin listed treatments, one bare and the other carrying cotton, gave the best retention of water with fairly low soil losses considering that in these cases frequent intercultivation kept the soil loose. Basin listing on fallow land has been better than when cropped with cotton so far as water retention is concerned but it is to be remembered that on the bare basin listed plot the basins were in existence throughout the year whereas in the cotton-cropped plot they were only built at the last intercultivation at the end of July.

It would be unwise to place complete reliance on figures for only two years but the indications are very much in favour of basin listing and they agree with the general experience in the area.

The soils of the Dry Zone of Ceylon differ considerably from those of this experiment. They are not calcareous and their low base exchange capacity indicates a kaolinite type of clay colloids less efficient in the formation of stable crumb than the tertiary soils of Burma. The rainfall and its distribution are similar or possibly more violent in Ceylon, while the crops which will have to be included in any rotation are similar. It seems safe to conclude that the losses of surface water and of soil are likely to be at least as high in the Dry Zone of Ceylon as in Burma and may even be more severe. The necessity for the adoption of methods of agronomy which will minimize such losses is imperative.

Estimates of Acreage and Yields of Paddy in Ceylon

Season and Year	Paddy—Extents Sown	Paddy—Yields			Rice—Production
		Yields—Paddy			
	Extents Sown (Acres)	Bushels	Long Tons	Metric Tons	Rice available for consumption Metric Ton *
Maha 1943–44	680,919	9,119,013	182,380	185,275	107,088
Yala 1944	349,313	4,447,192	88,944	90,356	52,226
Total 1944	1,030,232	13,566,205	271,324	275,631	159,314
Maha 1944–45	633,563	7,900,411	158,008	160,516	92,778
Yala 1945	262,097	2,900,059	58,001	58,922	34,057
Total 1945	895,660	10,800,470	216,009	219,438	126,835
Maha 1945–46	610,070	7,847,668	156,953	159,444	92,159
Yala 1946	317,008	3,502,851	70,057	71,169	41,135
Total 1946	927,078	11,350,519	227,010	230,613	133,294
Maha 1946–47	616,507	8,013,348	160,267	162,811	94,105
Yala 1947	310,176	3,506,982	70,140	71,253	41,184
Total 1947	926,683	11,520,330	230,407	234,064	135,289
Maha 1947–48	—	—	—	—	—
Yala 1948	343,055	4,344,562	86,891	88,270	51,020
Total 1948	—	—	—	—	—
Maha 1948–49	635,987	9,007,580	180,152	183,012	105,781
Yala 1949†	407,233	5,171,859	103,437	105,079	60,736
Total 1949	1,043,220	14,179,439	283,589	288,091	166,517
Maha 1949–50‡	665,091	9,701,257	194,025	197,105	113,927
Yala 1950‡	425,892	5,571,503	111,430	113,199	65,429
Total 1950‡	1,090,911	15,272,760	305,455	310,304	179,356

* Total production of paddy (less 15% seed allowance) converted into rice. Extraction rate 68%.

† Provisional.

‡ Estimate.

Questions and Answers on Ranikhet Disease

BY

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1. What is Ranikhet disease?

It is an infectious and highly contagious disease of poultry.

2. What is it called in other countries?

It is known as pseudo-fowl pest in Java, Doyle's disease or New Castle disease in England, Avian Pest in the Philippines, and Avian Pneumoencephalitis in U. S. A.

3. What is its history?

The disease was first discovered by Doyle in 1926 at Newcastle in England, and described by him as New Castle Disease (N. D.) In 1928, it was encountered by Edwards in Ranikhet, a hill station in United Provinces of India, and described as Ranikhet disease (R. D.). Since then it has been described from various parts of the world, Java (Pseudo-fowl), Philippines (avian pest). In 1940 a new disease was discovered in California and was called avian pneumoencephalitis but later it was found to be identical with R. D.

4. What is its distribution?

England, India, U. S. A., Java, Japan, Philippines, in fact world wide.

5. When did it first attract attention in Ceylon?

In 1928.

6. Why is it important to disseminate information about this disease?

Because at present it is the most prevalent and fatal disease of fowls in this country and is therefore Poultry Enemy No. 1.

7. What is the mortality?

In a flock attacked for the first time the mortality is from 90 per cent. to 100 per cent. specially if the flock is of the foreign breed. In flocks where the disease appears for the second or third time, the mortality is from 80 per cent. to 100 per cent.

8. What is the cause?

The cause is a very minute ultra-visible and filtrable virus. The virus is so small in size that it cannot be seen with the aid of the most powerful microscope, hence it is called ultra-visible. It is called ultra-filtrable because it can pass through filters (sieves) which hold back ordinary bacteria.

9. Where is the virus found?

The virus is found in all the tissues and fluids of sick birds and is contained in large quantities in discharges from the mouth, nostrils, and eyes, as well as in faeces of sick birds.

10. What birds are susceptible to this disease?

It attacks fowls of all ages, although it also affects turkeys, ducks and geese. Guinea fowls, pigeons, parrots, sparrows, and other birds like crows.

11. What are the methods of infection?

The natural methods of infection are—

(*a*) By contact of healthy with sick birds.

(*b*) By ingestion of food and water, and by using poultry appliances like feeding and drinking troughs, brooders, crates, &c., which have been contaminated with secretions and excretions of sick birds. Healthy fowls may also get the disease by picking up the offal of sick birds, feet feather, and other discarded parts of the diseased carcases as well as by drinking the water used in washing the carcases of sick birds. Artificially, it can be transmitted by injections of emulsions of liver and spleen and mouth discharges. It cannot be transmitted by injecting blood.

12. How does the disease spread?

The most common method is by introducing into the home flock without previous quarantine, a fowl bought from the open market or from unknown sources. People coming from an infected yard may also carry the infectious matter on their feet or foot-wear and scatter it in the yard of a clean flock. Scavenger animals like stray dogs and hogs, wild birds, crows, rats, &c., may carry pieces of infectious materials to a yard where they may be picked up by the susceptible fowls which thus get infected. Infected sparrows and other birds may also spread the infection.

13. Does the disease spread very quickly?

Yes, the disease spreads very quickly within a flock and from flock to flock.

14. What is the period of Incubation?

This is variable. The average is three (3) days. It may be as short as two (2) days or as long as fourteen (14) days.

15. What are the symptoms of the disease?

In most cases the disease runs an acute course. The first symptoms are ruffling of feathers, loss of appetite, slowness or disinclination to move and droopiness or sleepiness and increased thirst. The bird may be noticed to exhibit frequent or occasional swallowing movements due to increased secretions of saliva. Diarrhoea then sets in and soils the puff of feathers just below the vent. There is profuse dribbling of offensive ropy discharge from the beak and nose. There is difficulty of breathing, manifested by the characteristic gasping for air through the half-opened beak, the bird extending its head and neck and sometimes uttering a shrieking sound in an effort to clear its throat and respiratory passages. The temperature begins to fall from the beginning and becomes markedly subnormal before death. In laying flock there is almost total loss of egg production for 4 to 6 months. The shell structure is usually poor both when the birds go out of production and when they start laying after recuperation. The crop becomes distended with foul, sour-smelling gases or dirty liquid mixed with undigested feed. There may be swelling of head, eyelids, neck and throat. As the disease progresses the greenish white diarrhoea becomes more profuse and the bird becomes weak, sits down on its legs and may become paralysed. The respiration becomes more and more laboured, the comb and wattles turn bluish or purplish, and the bird finally dies, usually in from 2 to 5 days after the onset of the symptoms.

Resistant birds may get over the acute attack and recover completely and thus acquire life-long immunity or be left with nervous complications manifested by slight unsteadiness of the head or occasional twisting of the neck which may be so marked as to cause the bird to tumble whenever it attempts to take the feed. Birds developing these paralytic symptoms also die after sometime due to their inability to get proper nutrition.

Cloudiness of the cornea may occur as a primary lesion of the disease or as sequelae or complication in protracted or recovered cases.

16. What is the duration of illness?

This is usually short and varies from 2 to 5 days.

17. What are the changes seen at post-mortem examination?

If the carcase is opened there will be found haemorrhageic spots in the proventritulus (the lowest part of the oesophagus joining the dissard), and in the cloca.

18. How can the disease be diagnosed?

It is difficult to give definite diagnosis of Ranikhet disease without laboratory facilities. If an outbreak showing respiratory symptoms followed by nervous and paralytic symptoms occurs in young chicks, they should be suspected of R. D. and sent to the Veterinary Laboratory for diagnosis. Laying flock in which there are bronchitis like symptoms of gasping, wheezing and rattling together with an abrupt stoppage of egg production, should be suspected of R. D. and the affected birds sent to the Laboratory.

19. Is there any treatment for the disease?

So far no curative agent has been found for this disease. Cases of relief and recovery following the administration of so-called " remedies " are merely coincidences and the birds so treated could have recovered without any treatment at all. Individual as well as mass treatment of this highly infectious disease is not only futile but quite dangerous because of the time lost before more appropriate control and preventive measures can be put into operation.

20. Is there any preventive inoculation against this disease? Yes, a vaccine is available. It is manufactured at the Veterinary Research Laboratory, Peradeniya.

21. How is the vaccine prepared?

The virus is inoculated into chick embryos and after two days the embryonic fluid is collected. This fluid is the concentrated vaccine which has to be diluted before use.

22. At what age should the vaccination be done?

Only birds over 4 weeks old should be vaccinated. It is important to get them vaccinated before they start to lay.

23. How is the vaccine despatched to the field?

In sealed glass ampoules each containing $\frac{1}{2}$ cc. of concentrated vaccine. This is to be diluted with distilled water to make 500 cc. which is enough to vaccinate 500 birds.

24. Are there any precautions for the storage of vaccine?

Yes, it has to be kept in a thermosflask containing ice and in no case should the ice be allowed to melt before the vaccine is used.

Attempts are being made to evolve a method for keeping the vaccine alive at room temperature.

25. What is the dose of vaccine?
1 cc. of the diluted vaccine.

26. How is it given?
It is inoculated subcutaneously or intramuscularly.

27. Are private owners allowed to vaccinate their own birds?
No.

28. Have I to pay for the vaccination?
No.

29. Who is to vaccinate the birds?
Trained vaccinators working under the supervision of the Range Veterinary Surgeons.

30. How can I get my birds vaccinated?
Write to the Veterinary Surgeon of your district or the Veterinary Research Laboratory, Peradeniya.

31. Is vaccination compulsory?
No. At present it is optional.

32. What precautions are to be taken after vaccination?

(*a*) Prevent overcrowding.
(*b*) Protect vaccinated birds from adverse weather conditions.
(*c*) For 48 hours after vaccination, keep vaccinated birds away from infected.
(*d*) Feed well.
(*e*) Report all untoward occurrences, specially death, to the Veterinary Surgeon of your range.

33. Is the vaccination curative?
No. It is only preventive.

34. How soon is the immunity conferred after vaccination?
About 48 hours after the vaccination.

35. How long does the immunity last?
For the lifetime of the bird.

36. Are there any conditions when the vaccination should not be undertaken?

(*a*) Vaccination should not be undertaken if the age of the bird is below 4 weeks.
(*b*) If diseases like Ranikhet, Coccidiosis, Fowl pox already exist in your farm.
(*c*) If the weather conditions are adverse, e.g., rainy or very hot.

37. Are there any untoward results from this vaccination?

(*a*) Drowsiness.
(*b*) Lameness.
(*c*) Paralysis.

(Birds affected with lameness or paralysis should be removed to a separate pen and if no signs of improvement are evident, without any particular attention, should be disposed of for table purposes. Ordinarily they should come to normal in 10-14 days.)

(*d*) Egg-laying stopped from 14 days to 3 months.
(*e*) Death rate about 5 per cent.

38. Is any compensation paid to me in cases of death after vaccination?

No.

39. How can the disease be prevented from entering my poultry farm?

(*a*) Prevent your fowls coming in contact with those of your neighbours by fencing your poultry house and its yard with poultry wire, making them bird-proof. This will prevent intrusion of predatory animals also.

(*b*) Divide the flock into small units so that in case of infection all the birds in it are not exposed.

(*c*) Do not admit any chicken sellers or visitors either in the poultry house or its yard.

(*d*) As soon as any bird is suspected to be sick, especially when it remains in the perch early in the morning, separate it from the flock and keep under observation.

(*e*) Always place a tray of disinfectant outside the gate of each unit and see that every one walks through it upon entering and leaving the unit.

(*f*) Clean and disinfect all poultry crates, utensils and appliances thoroughly and dry them before using them again.

(*g*) Do not introduce new birds into your flock without previously quarantining them for a period of at least two weeks in a place far away from the home flock. Burn or bury discharges from such fowls. Birds returning from poultry shows should also be quarantined for 14 days.

(*h*) For table purposes, get your chickens from healthy flocks. If you purchase them from the open markets, kill them immediately. If for some reason or other, you have to keep for sometime before killing, isolate them in a coop inaccessible to other fowls. Burn or bury all droppings and left over feed.

(*i*) In dressing chickens, do not throw the offal (crop, intestines, trachea, lungs, kidneys, bills, claws, &c.) and other parts of the dressed carcase in the yard or any place where they may be picked up by other fowls and scavenger birds. Wrap them in old newspaper and either dump them in a garbage can filled with some disinfectants or better still burn or bury them in lime.

(*j*) Vaccinate the fowls against Ranikhet Disease. Do not wait for the disease to appear before vaccination is started.

40. What steps shall I take to control the disease when it has already broken out in my flock?

(*a*) Immediately remove all apparently healthy birds from the infected area to fresh, clean, non-infected quarters. Here carry out segregation of the birds, placing them in individual cages or coops which can be made out of bamboo or empty kerosene tins. Fowls may be caged in groups of two, three or four in each coop, if the number of coops is not enough. If yours is a commercial poultry farm where the birds are divided into different units, and disease has broken out in only one of these units, the drastic procedure of killing all the sick, contact and exposed birds will prove successful and effective. Carry out careful daily examination of birds and immediately destroy those that show symptoms of disease. Burn or bury deep in lime all dead birds; destroy all diseased birds and dispose of their carcases and droppings in like manner.

(*b*) Clean and thoroughly disinfect all poultry utensils and appliances including coops, nests, drinking and feeding troughs, &c., as well as the roosts, walls and other parts of the poultry house and their yards with 2-3 per cent. creolin solution or crude carbolic acid or any reliable disinfectant. Spray pump will ensure the uniform efficient application of the disinfectant. (To make a 2-3 per cent. solution of the disinfectant, stir one to one and one-half milk-canful of the disinfectant in a five-gallon canful of water.)

(*c*) Or give lime wash which contains ½ lb. of carbolic acid per gallon of wash.

(*d*) Disinfect with dry heat, e.g., Brazier's lamp, those parts that can stand it.

(*e*) Apply a layer of slaked lime to the runs or better still dig them up. Never use them for at least two months after the disappearance of the disease.

(*f*) If you have had to destroy the entire flock, leave the buildings vacant for at least three months before re-stocking them.

(*g*) Admit more sunshine especially in wet places by cutting branches of trees standing in the yard.

(*h*) Do not forget to place a tray of disinfectant at the gate of each compartment for the caretaker and everyone else to pass through upon entering or leaving the place.

(*i*) Ensure that healthy birds receive clean water and their drinking vessels are cleaned and boiled at least once a week. Add potassium permanganate to the drinking water in the proportion of 1 gram of the drug to every 5 litres of water. This is best placed in an enamel or earthenware vessel as it easily decomposes in an iron or galvanized iron container.

(*j*) If possible provide separate attendants for the (*a*) contact (*b*) the exposed, and (*c*) non-exposed flock. Confine the affected in their own premises. In case this is not possible and the same person has to take care of the three groups of chickens, ask him to attend to the healthy flock first, then the exposed, and the contact last. He should change his clothing and foot-wear and disinfect his hands and feet every time he makes the shift.

(*k*) Neither sell nor purchase poultry for at least three months from the date on which the deaths ceased to occur.

The Late Sir Frank Stockdale, C.B.E., C.M.G., G.C.M.G., M.A., F.L.S.

It is with deep regret that we learnt of the passing away of Sir Frank Arthur Stockdale which took place at his London residence in August last.

Sir Frank Stockdale was Director of Agriculture, Ceylon, from December, 1916, to November, 1928. Previously he held successively the posts of Mycologist and Lecturer in Agricultural Science in the Department of Agriculture for the West Indies, Assistant Director of the Department of Science and Agriculture of British Guiana and Director of Agriculture in Mauritius. After twelve years service in Ceylon he was selected to fill the post of Chief Agricultural Adviser to the Secretary of State for the Colonies in the Colonial Advisory Council of Agriculture and Animal Health in London, a special distinction conferred on him in acknowledgment of his experience and good work in the Colonial Agricultural Service.

Sir Frank (then Mr. F. A. Stockdale) was the first to hold the post of Director of Agriculture, Ceylon. Before his appointment the agriculture of the Island was entrusted to the Directors of the Royal Botanic Gardens, who were a succession of eminent scientists but whose attention was divided between purely botanical studies and that of agriculture. There was no organised Department of Agriculture; but the Ceylon Agricultural Society carried out such agricultural development work as could be done at the time with a small staff and under the main responsibility of Mr. Christie Drieberg, who was Secretary of the Society for many years.

Sir Frank, therefore, had both the task and the opportunities of organising a Department of Agriculture for the Island. He brought to this work experience, skill and great energy which soon resulted in the foundation of the headquarters of the Department at Peradeniya which are a permanent monument to his foresight and ability. He elaborated a scheme for the development of the new department on two well marked lines, scientific research and field extension work. Laboratories were built for Agricultural Chemistry, Plant Pathology and Entomology along with a well equipped library which is today one of the best of its kind. He had a small staff of scientific workers but they included men of such outstanding ability as the late Messrs. Tom Petch, Kelway Bamber and H. F. MacMillan. He recruited further scientific staff and gave an impetus to research in agricultural science.

Under his scheme for extension of the work throughout the country a number of Agricultural Divisions were created, each in charge of a Divisional Agricultural Officer with a staff of Agricultural Instructors. A number of Agricultural Stations were opened in various parts of the Island. These served as demonstration stations for improved methods of cultivation and to a smaller extent for scientific trials and experiments. Two Farm Schools were opened at Peradeniya and at Tinnevelly, Jaffna, to provide an agricultural training for the sons of agriculturists and for the training of Instructors for the Department. He also inaugurated the Co-operative Movement, and he was the first Registrar of Co-operative Societies in addition to his own duties. The Central Board of Agriculture on its present lines was formed as an advisory body on agriculture, and an annual agricultural conference was a feature of Sir Frank's period as Director.

LATE SIR FRANK ARTHUR STOCKDALE, C.B.E., C.M.G., G.C.M.G., M.A., F.L.S.
Director of Agriculture, Ceylon, 1916–1928

In these early years of the development of the Department attention principally centred on the plantation crops which brought in the major part of the Island's revenue. Sir Frank took up the pressing problem of Research Institutes for the chief plantation crops at an early date. The Tea and Rubber Research Institutes were soon founded and the Coconut Research Scheme was in its infancy at the time of Sir Frank's departure from the Island.

While the progress made by the Department of Agriculture has been very considerable especially after the Ministry of Agriculture began to function, Sir Frank will be remembered for the experience, ability and vision with which he laid the foundations for the future development of the Department. His proposals always received the most favourable attention of the Government and of the Old Legislative Council on which he served as a member.

Sir Frank's genius lay in organisation and administration and he will be remembered in the history of this Department as its first Director and its farsighted organiser.

2——J. N. A 95638 (2/50)

PROCEEDINGS OF THE THIRD MEETING OF THE CENTRAL BOARD OF AGRICULTURE HELD IN THE BOARD ROOM OF THE SUISSE HOTEL, KANDY, ON AUGUST 8, 1949, AT 2.30 P.M.

Mr. D. Rhind, the Director of Agriculture, presided and the following were present:—Senator C. A. M. de Silva; Mr. U. B. Unamboowa; Mr. S. L. Bandara Dharmakirti; Mr. A. Hensman; Mr. A. M. Clement Dias; Major E. C. de Fonseka, M.B.E., E.D.; Mr. H. A. Peiris, Divisional Agricultural Officer, S. E. D.; A. E. Madawala Dissawa; Mr. R. H. Spencer-Schrader, J.P., U.M., Dr. E. Phillis, Director, Rubber Research Scheme; Mr. F. C. Cooke, Director, Coconut Research Scheme; Dr. W. R. C. Paul, Acting Principal, School of Agriculture, Peradeniya; Dr. M. F. Chandraratne, Botanist; Mr. A. W. R. Perera, Assistant Marketing Commissioner (representing the C. D. M.); Mr. R. B. Thalakada, Assistant Registrar of Co-operative Societies (representing the R. C. S.); Mr. P. B. Tennekoon; Mr. U. B. Dedigama; Mr. P. B. Bandaranayake; Mudaliyar N. M. Abulcassim Maraikar; T. B. Poholiyadde Dissawa, M.P.; Mr. W. M. Cumaraswamy; Mr. Marcus S. Rockwood; Mr. R. T. Chelliah, Mr. Thomas Amarasuriya, Chairman, Low Country Products Association; Rev. Fr. L. W. Wickremasinghe; Senator C. Wijesinghe; Dr. R. V. Norris, Director, Tea Research Institute; Mr. S. A. I. Elapata; Sir James P. Obeysekera; Gate Mudaliyar N. Wickremaratne; Mr. H. Abeygoonasekera; and Mr. H. E. S. Ranasinghe, C.C.S., Secretary, Central Board of Agriculture.

The following visitors were also present:—Mr. S. G. George, O.B.E.,; Mr. W. D. E. Perera, Livestock Officer of the Department.

Letters and telegrams regretting inability to attend the meeting were received from the following members:—

Senator (Col.) T. Y. Wright, V.D.; Conservator of Forests; Mr. W. P. A. Wickremasinghe, M.P.; Mr. K. W. Devanayagam; Hon. Mr. H. W. Amarasuriya, Minister of Commerce and Trade; Mr. E. Abeyratne, Agricultural Research Officer, Maha Illuppalama; Sir Wilfred de Soysa; Director of Irrigation; Registrar of Co-operative Societies; Mr. A. Perumynar; Mr. E. Muttukumaru; Senator Justin Kotalawala; Land Commissioner.

I. CONFIRMATION OF THE MINUTES OF THE LAST MEETING

The minutes of the previous meeting were confirmed subject to certain amendments suggested by a member and accepted by the meeting.

II. VOTE OF CONDOLENCE

Gate Mudaliyar N. Wickremaratne moved the following resolution:—

"The Central Board of Agriculture, Ceylon, by resolution expresses its deep sympathy with the surviving members of the family of the late Sir Frank Stockdale, C.B.E., C.M.G., G.C.M.G., on the latter's death, and places on record its appreciation of the services rendered by the late Sir Frank Stockdale as Director of Agriculture, Ceylon, from December 1916 to February 1929. He was entirely responsible for the organisation of the Department of Agriculture in its present form with its Research and Field Divisions and for providing the Department with the well equipped laboratories which exist today. The late Sir Frank Stockdale also contributed largely towards the research into and improvement of the plantation crops in the Island and was responsible for the establishment of the Tea, Rubber and Coconut Research Institutes.

The Central Board of Agriculture, Ceylon, further resolves to forward a copy of this resolution to the serviving members of the family of the Late Sir Frank Stockdale."

In moving the Resolution, Gate Mudaliyar Wickremaratne dwelt at length on the capabilities of late Sir Frank Stockdale as a Scientist, Agriculturist, legislator, and administrator. During his time he had been one of the most popular European officers in the Island. Commenting on his devotion to duty, Mudaliyar Wickremaratne said that Sir Frank used to work invariably after normal office hours and that he was exceptionally clever in disposing of office papers expeditiously. At the time he assumed duties as Director of Agriculture, he had to work in a small office in the Herbarium. Before long he had foreseen the future expansion of the Department and the present Headquarters of the Department were constructed on his own initiative. Mudaliyar Wickremaratne also stated that at the time the late Sir Frank was leaving the Island in 1929, his photograph was unveiled at the Headquarters. He had organised various Research Schemes and the last was the Coconut Research Scheme. He was an officer who had travelled far and wide in the country for the sake of promoting agriculture. The last thing he did was to go into the question of paddy. In 1926 he appointed sub-Committees all over the Island to go into the question of paddy. In this connection he asked his officers like the Manager of the Experiment Station and the Manager of Maha Illuppalama farm to prepare a questionnaire. They could not prepare this and at last he drew it up himself. These questionnaires were sent to every district and information was collected, but before he could complete this work he had to leave the Island and that was why he could not do much for the promotion of paddy cultivation in the Island. Having enumerated most of the invaluable services the late Sir Frank had rendered to this Island, Mudaliyar Wickremaratne concluded by stating that the Island would always owe a deep debt of gratitude to Sir Frank Stockdale.

Mr. Thomas Amarasuriya seconded the resolution which was unanimously adopted by the Board in the usual manner, all the members standing.

III. FOOD PRODUCTION

The next item on the Agenda was to consider proposals put forward by the Special Committee appointed by the Board to make proposals for increasing Food Production. The Chairman pointed out that the Hon. the Minister was very anxious that the proposals of the Special Committee should reach him as early as possible and therefore hoped that the discussions on the various points laid down in the report would be finalised at that meeting. The Chairman also added that that was a subject on which there could be almost endless discussion because there was no end to the subject but that they should embody their ideas into resolutions which the Minister could deal with.

Mr. Spencer-Schrader inquired whether the proposals in the report were to be taken up for discussion item by item or as one whole subject.

The Chairman was in favour of considering it as one whole subject.

Mr. Thomas Amarasuriya explained that the subject under discussion was so important that it should be gone into thoroughly and as such it was better to consider the proposals item by item.

Gate Mudaliyar Wickremaratne explained that those proposals were discussed during the last 30-odd years without any finality but now they had been embodied in one paper by the sub-Committee as to enable the Minister to approve them after consideration. He added that the proposals put forward were concrete proposals and suggested that the report should be adopted and sent to the Minister. If there were members who disagreed with any of the proposals, he suggested that the disagreements should also be embodied and submitted to the Minister.

The Chairman stated that as the meetings of the Board were not very frequent, he had already started work on some of the proposals in the report.

The members expressed their satisfaction that work on some of the proposals in the Report had already started.

The Chairman proposed that the Board should adopt the Report of the Special Committee and resolve to forward a copy to the Hon. the Minister for such action as he deems suitable and necessary.

At that stage Mr. P. B. Tennekoon drew the attention of the Board to the following remark made in paragraph 13 of the Report of the Special Committee,—" On reviewing the past work of Vel Vidanes and taking note of the common opinion held over a long period that Vel Vidanes do little in return for the fees they get, ..." Mr. Tennekoon emphatically stated that it was incorrect to give that impression about the work performed by Vel Vidanes since he was personally aware that in the surplus areas, particularly in the N. C. P. they did much work for the fees they received. He therefore requested that a correction of that statement should be made before the report was submitted to the Minister.

Mr. Spencer-Schrader said that he was unfortunately prevented from being present at the last meeting and asked for their indulgence therefore, if he was allowed to refer very briefly to one or two points regarding the last meeting of the Central Board. He said that few people have read all the history books, the Maha and Sulu Wansas, with the result that both inaccurate statements and incorrect interpretations of statements were allowed to pass for history and were accepted as facts. Gate Mudaliyar Kariapper had stated at the last meeting of the Board that " The Director of Agriculture in the ancient days was really the king." Referring to this statement, Gate Mudaliyar N. Wickremaratne had said " This is very true. King Dutugemunu directed his brother, Tissa to supervise cultivation and said, " I am going to fight for the religion of the country, you had better go and cultivate the land." Unless Geiger's translation of the Mahavansa is very inaccurate, the king said nothing of the sort. The actual words in the translation were " And thither too he sent his brother to direct the harvest; and he too, when he had made it known by beat of drum, directed the work of harvest. " In this connection he drew attention to another, interpretation that an uncle of Pandukabhaya, named Girikandasiva, drew his revenues from the district near the Kasa Mountain that Panduvasdeva had handed over to him. This Prince was even then on the point of reaping a field measuring a hundred karisas. The King's interest may well have been centred not so much in the cultivation of crop as in the harvest from which he drew his revenues. He emphasised that a similar interest in agriculture was shown today by the absentee landlord who visited his estates only when a crop was being harvested.

Mr. Spencer-Schrader making the following quotation from the Rajavaliya stated that one of the reasons for the Great Dynasty ending in 362 A.D. with the death of King Mahasena was that " The produce of agriculture and horticulture was failing." Mr. Schrader argued that in view of the fact that the vast majority of the tanks were constructed after that time, the oft repeated legend that " Ceylon was the granary of the East " was not based on truth and had only gained credence through frequent repetition.

Mr. Spencer-Schrader next dwelt on certain proposals contained in the Report of the Special Committee. Referring to proposal No. 6 (3) of the Report, " That demonstrations be given in the stalling of cattle at night and the making of farmyard manure, the making of compost, use of green manure and the growing of these on paddy fields," he said he had for many years advocated the proper use of cattle in restoring and maintaining soil fertility. He had seen in Jaffna, a system of folding cattle on the land which he said might well be adopted in all other parts of Ceylon. Treading on straw was another method that would supply, provided sufficient straw was given, about ten tons of first rate manure per head. He had used this latter method for many years and had no hesitation in recommending it. He emphasised that it was a crime of the worst sort to sell or burn straw and he viewed with considerable concern the proposal to use several thousand tons per year to make paper. He felt that education in the absolute necessity for returning to the land all the straw that comes off it was essential if any schemes to produce more food were to succeed.

Regarding proposal No. 9 (2) of the Report—Control of Pests—Mr. Spencer-Schrader stated that there were other pests beside insects. Parrakeets, doves, pigeons, and above all, the Munnia, the little " Vi-kurulla ", which consume in the aggregate a collossal quantity of grain. Those birds, particularly the last named, might be called " avian rats ", and should be controlled if the quantity of cereals harvested was to be increased.

Regarding proposal No. 12, " That the Cattle Branding Ordinance be made compulsory ", Mr. Spencer-Schrader stated that originally this Ordinance was intended to reduce, if not prevent, cattle lifting, but was never conspicuous for its success. He said that the remedy for cattle lifting lies in the hands of owners who should herd their cattle carefully, feed and water them well and enclose them at nights. By this means, he said, they would improve the stock and an abundant supply of manure would be ensured.

Commenting on proposal No. 16 (1) " That Government should consider the possibility of using Bull-dozers and Euclids, etc., for deepening tanks which have become silted up ", Mr. Spencer-Schrader said that a similar resolution was to be moved by Mr. Hensman and wished if both could be considered together.

Mr. Hensman said that he had sent in his resolution first and Fr. Wickremasinghe had sent a resolution subsequently.

Mr. Spencer-Schrader admitted that de-silting of tanks was extremely important and endorsed the view that Bull-dozers and Euclids could deepen the tanks which are silted, but he emphasised that the most important thing to be done was to remove the cause of this silting, which was soil erosion. He added that it was one of the fundamental principles of sound agriculture that water should be conserved at as high a level as possible in the soil. He quoted many examples of dams in various parts of the world which have been completely filled up with silt in a number of years due to soil erosion. A significant example he quoted was the Harding Reservoir in California which was gagged in one month by heavy rains following forest fires in the water shed.

Mr. Spencer-Schrader also stated that no mention of highland paddy was made either in the minutes of the Central Board meeting of 16th May or in those of the Special sub-Committee meeting held on 3rd June. He felt that high land paddy could be grown if water was stored in the soil instead of in surface reservoirs in which the rate of evaporation was so high.

" Sir James P. Obeysekere next referred to the editorial in the " Tropical Agriculturist " of April-June 1948, as setting out the world problem of the urgent need for food production, and that of July-September 1948, on silting and erosion. He believed that instead of asking for a minimum guaranteed price for paddy which would mean that the consumer would have to pay a higher price and involve Government in international complications, it would be an encouragement to paddy cultivation on a large scale in the Northern, North-Central and Eastern Provinces if paddy were excluded from Income Tax. He added that the rubber industry had reached a very bad stage and felt that coconuts were also liable to go down in price when some countries which consumed our Coconut oil would very soon be extracting vegetable oil as substitutes. Therefore paddy cultivation on a large scale should be encouraged and essential food should be made as cheap as possible, fixing a price to benefit paddy cultivators means that the consumer has to pay more ".

Mudaliyar Abulcassim Maraikar stated that the policy of the Ministry was achievement of the maximum self sufficiency within a reasonable period of time and secondly to bring under cultivation the maximum possible extent. In this connection he raised a particular point in a Government circular that cultivators who asweddumized paddy lands were given a subsidy of Rs. 100 but there was a limitation to that subsidy, namely, that cultivators of 5 acres and under only were eligible for that subsidy. He said that it was the general feeling among cultivators that more than 5 acres could be asweddumized but for this limitation which was an obstacle and a hindrance to bringing more land under cultivation.

Mudaliyar Abulcassim Maraikar referring to the Minister's speech of the 16th May, said it was his policy to bring under cultivation the maximum possible extent of land and as such he felt the payment of the subsidy of Rs. 100 per acre for asweddumizing 5 acres and under was definitely a hindrance to cultivators who would otherwise cultivate over 5 acres.

Referring to proposal 17 (7) of the Report of the Special Committee, Mudaliyar Abulcassim Maraikar said that although the staple food of the country was rice, there were possibilities of growing yams, pulses and such other crops in the Dry Zone where a system of well irrigation prevails. Therefore he suggested that some assistance should be given to cultivators in these areas for constructing wells. If that was done he felt it would give greater encouragement to the cultivator to produce food crops in addition to rice.

Regarding the policy of the Minister that self sufficiency should be achieved in food. he said there were two ways of making this country self sufficient. One was to eliminate our dependence on imported food, the other was to increase the productivity of paddy. So far they had succeeded in bringing more than ⅓ of the cultivable area under paddy but yet they had the remaining portion to be brought under cultivation. He wondered how long that was going to take. He emphasised that speed was very essential in this matter and ventured to suggest a system adopted in places like America which was called "Face Lifting". What was meant by "face lifting" was contouring of the land. In the year 1946 a certain field in America which was 101 acres in extent was made fit for cultivation and colonization in one day. This work had been done by cultivation experts. by friends and by teachers who according to the system of education existing there, volunteered their help in these operations. If the Government had undertaken this work, according to information obtained from experts, at least 5 years would have been spent on that work. He had read an article on "Face Lifting" and soil conservation methods and wondered whether that should not be submitted to the Minister at the next Board meeting. He said that the young Minister within two years of attaining independence has been indefatigable in his efforts and has increased the agricultural prosperity of this country. He ventured to submit those proposals for his favourable consideration. He added that those suggestions alone would not make the country self sufficient. and that they should try to stop as early as possible the importing of food from elsewhere. He emphasised that the Minister himself had quoted in one of his speeches that the food bill of this country alone came to about Rs. 500 millions.

Mudaliyar Abulcassim Maraikar made another suggestion that as various Departments have organised Field Days, Health Weeks, National Savings Weeks. etc., an Agricultural Day or an Agricultural Week should be organised on similar lines all over the Island with a view to improving and increasing the yields of paddy cultivation.

At this stage Senator C. A. M. de Silva suggested to the Chairman that a time limit should be made for speeches. He added that sometime ago that suggestion was made and felt it was advantageous to implement it.

Mudaliyar Abulcassim Maraikar excused himself for taking too much of the time of the meeting and said that if an Agricultural Week was started it could be organised in different districts at one and the same time. This kind of propaganda, he said. would tend to induce the cultivator to increase his yields in paddy and also be an encouragement to manure his fields with artificial manure. compost. etc. He concluded with those suggestions hoping that they would be considered favourably.

Mr. H. A. Peiris. D. A. O., Tangalla. said that an Island-wide agricultural day or agricultural week was not possible as harvesting seasons differ in various parts of the Island and furthermore he felt that such an organisation would not be necessary since agricultural days and weeks were already held in Divisions with a view to agricultural propaganda.

The Chairman at this stage felt that the proposals of various members. arising out of the report. might have to be treated as supplementary resolutions, and if there were any recommendations on the proposals in the report they might be treated as subsidiary recommendations. Taking the last suggestion of Mudaliyar Abulcassim Maraikar first, he said that the suggestion to organise an Agricultural Day might be adopted as a resolution from the Board. Regarding paragraph 13 of the Report which was commented on by Mr. Tennekoon that the remark about Vel Vidanes was not quite correct. he said that if it was the feeling of the house that that remark was derogatory, it could be amended.

Mr. H. A. Peiris stated that the A. G. A., Matara. had organised paddy transplanting and had brought 700 acres under cultivation and felt that as far as Matara District was concerned. the Vel Vidanes generally did a lot of work.

The Chairman said that the general feeling was that Vel Vidanes would not do anything on their own unless they were told to do it and if they were able to do anything they did it quite well. He added that what they had in mind was that Vel Vidanes could do a lot if they were made to do so.

It was however agreed that the preamble to proposals (1), (2) and (3) under para 13 of the Report—Work of Vel Vidanes—should be deleted altogether.

Gate Mudaliyar Wickremaratne inquired if a para could be added under the heading " Stability of prices at economic levels " to the effect that payment of Income Tax was meaningless.

Senator Wijesinghe suggested that essential foodstuffs such as rice and other cereals should be excluded from Income Tax until such time as Ceylon was self sufficient in such foodstuffs.

The Chairman said that in India the system that prevailed was land revenue on paddy and not income tax.

Mr. Clement Dias suggested that the words " and vegetables " should be added to para 17 (7) of the Report to read " Encouraging the consumption of herbs and vegetables

This addition was agreed to by the Board.

At this stage Senator Wijesinghe drew the attention of the Chairman to the suggestion he had made with regard to the exclusion of Income Tax on paddy.

The Chairman wished it to be brought up as a fresh resolution.

Senator Wijesinghe explained that stability of prices and what the producer would get as a result of the stability were two allied subjects and therefore the exclusion of Income Tax could also come into the same proposal.

At this stage, Sir James P. Obeysekera proposed and Senator Wijesinghe seconded that " No Income Tax or any other tax be levied on the income derived from rice cultivation until such time as Ceylon is self sufficient in rice ".

The motion was carried.

Mudaliyar Abulcassim Maraikar moved formally " That the subsidy of Rs. 100 granted by Government for asweddumizing paddy lands should not be limited to 5 acres and under as at present, but should be applicable to any extent of land asweddumized for paddy cultivation ".

Senator Wijesinghe seconded, and the motion was carried.

Mr. Marcus Rockwood made certain proposals for the consideration of the Board and read the following extracts from a letter he addressed to the Minister of Agriculture and Lands on the Internal Purchase Scheme for paddy on September 4, 1943.

> A. Through Cultivators and Vel Vidanes, with the co-operation of Cultivation Officers, under the direction of specially appointed Food Production Officers, the whole Island to be zoned so that in the light of past experience it will be possible to say such-and-such a district could yield, X, Y or Z bushels per acre. Distinction will have to be made for irrigable lands, rain fed lands, and areas twice cultivated ".
>
> " When this is achieved,—
>
> B. Cultivators must be told that his standard of production is fixed at so much, and that he will be given a bonus for every bushel up to five in excess of the fixed yield, and a further premium bonus for yields over and above that amount, viz., X plus 5 bushels.
>
> C. Vel Vidanes should also be offered a bonus for every bushel harvested in excess of the stipulated yield plus any pay or salary which goes with his post.
>
> D. Cultivation Officers who help to produce high yields should be marked for special promotion.
>
> E. The same inducement or something similar should apply to the specially appointed food production officers who should also maintain a high state of production in other food crops.

He also recommended that the penalties for any wrongs should be drastic, dismissal or imprisonment without warning after a most thorough enquiry.

He added that all those officers should be provided with printed forms to enable them to collect the statistics required. When completed they should give the name of the owner, cultivator, extent of field, how irrigated, location, rate of sowing, time of sowing and

harvesting area cultivable and yield obtained during each particular harvest. Also particulars of labour employed and whether the methods adopted in cultivation were up to requirements. If yield was below the fixed standard, the reason why.

He felt that it would be a further inducement if cultivators were formed into groups of 50 or 100 acres and handsome prizes could be given to the group that produced the highest yield for that District.

The Chairman replied that the Department had actually started in a small way to get statistics and requested Dr. Chandrasena, Botanist of the Department, to explain.

Dr. Chandrasena said that they had already started a pilot survey of paddy yields of Kandy, Kegalle and Ratnapura Districts. He said that this was on a small scale but it was hoped to extend it to the whole Island. He hoped that the results of the survey already being carried out in Kandy, Kegalle and part of the Ratnapura District would be ready in the next few months. This survey was expected to be extended to the whole Island, if not this Maha season, the very latest by Maha 1950. Information was being already collected on what Mr Rockwood desired. Information on the measures used with the quantities used per acre, on the type of cultivable land, on the type of implements, the estimated yields, etc., he said would give a fairly clear picture of paddy cultivation as practised in Ceylon.

Sir James P. Obeyesekera made inquiries as to the yields of salt resistant paddies and Dr. Chandrasena replied that the most promising salt resistant paddy was Pokkali which has been grown at Mutwapawela. He promised to collect the information which Sir James asked for.

Mr. Rockwood suggested that intensive cultivation of paddy should be encouraged and felt that the yields of the existing fields could be increased and stated that if a bonus was paid to the cultivator whose yield was higher than the average it would be an inducement for better cultivation and also eliminate the black market.

Dr. Chandrasena replied that it would be several years before they could decide what the normal yield for a tract was and until that was decided, Mr. Rockwood's suggestion could not be implemented.

Mr. Spencer-Schrader inquired whether highland paddy was not of any importance since it has been omitted altogether at the discussions of the sub-Committee.

Mr. Heenman felt that highland paddy such as Ekwee and Godawee required no standing water and as such it should be possible to extend its cultivation.

The Chairman replied that to grow paddy without standing water was generally a failure except under high rainfall throughout the growing period.

Mr. S. Ekanayake at this stage moved that "There should be an abolition of import duty on all agricultural implements".

Mr. Heenman seconded.

This resolution was put to the house and unanimously adopted.

Pohottuwatte Dassawa moved another resolution that "Import duty on gun-powder and caps for muzzle loaders be abolished".

Mr. P. B. Tennekoon seconded this resolution.

A long discussion ensued as to the practicability of implementing this resolution since gun-powder was used not only for agricultural purposes but for various other purposes such as Fire Works manufacture, blasting rocks, etc., and the general opinion of the house was that if this resolution was adopted, a large proportion of men engaged in other trades would benefit besides agriculturists.

At that stage Pohottuwatte Dassawa withdrew his resolution and said that if the house was not supporting that resolution he hoped to bring it up in Parliament.

The house felt that Mr. Heenman's resolution 3 (c) was almost similar to the resolution brought forward by Rev. Fr. Wickremasinghe. Mr. Heenman explained that he had at first sent in his resolution with a memorandum on the subject and subsequently Fr. Wickremasinghe had brought up a resolution on the same lines. Mr. Heenman, however, agreed to withdraw his resolution to avoid redundance.

IV. SHEEP FARMING

Mr. Hensman next formally moved his resolution (b) (i), of the Agenda that—

"This Board recommends that early steps be taken to explore the possibilities of opening sheep farms in different parts of the Island with a view to increasing the food supply and eventually for export of mutton."

Mr. Hensman read an extract from the press in support of his resolution to indicate that sheep farming was a paying concern and felt that there ought to be places in Ceylon where sheep farming would be a success. Mr. Hensman mentioned that Mr. de Fonseka had also experimented in sheep farming in Ceylon and that he would speak about his experience.

Major de Fonseka seconding the resolution said that he had carried out some experiments at Diyatalawa with the white black-faced Abyssinian sheep and that he had met with some success. Later on he had tried the Brown Indian sheep which had done very well during the dry weather but they failed during the wet weather. He felt that the vast extents of Patna land in Uva dry areas should prove suitable for sheep farming. He added that India had 36 million sheep and that had a very flourishing industry in sheep farming. Bikaneri and Doombas did well in India. Merino did well in Australia and he believed that Lohi would do well in Ceylon. The Lohi was a white animal with a reddish head and sometimes with a black head. This animal produced good mutton and about 8 lbs. of milk from which very good ghee could be obtained. In addition its wool could be used for making carpets and sambilies which have a great demand Up-country. He felt that it was advantageous to try a few experiments in Ceylon.

The Chairman asked Mr. W. D. E. Perera, the Livestock Officer of the Department for his views.

Mr. W. D. E. Perera read the following extract from a letter sent in 1946, by the then D. A. to the American Consul in reply to an enquiry by the latter:—"There are very few sheep in Ceylon. The only places where they are found in any considerable numbers are the Jaffna Peninsula, the Mannar District and some parts of Batticaloa District.

The sheep found in these places are all approximately of the same type. They are small sheep generally brown or black in colour. The coat is composed of short coarse hair rather than wool. They are kept purely for their mutton. They are of no value as producers of wool and are never clipped by their owners. They resemble the short haired type of sheep found in South India.

You will note that the districts which I have mentioned above are the dry parts of the Island. The Low-country wet zone and the Up-country zone seem to be too wet for sheep.

There are very few sheep of imported breeds in the Island. Mr. Leslie de Saram of Welimada has a few short woolled sheep of the Bangalore type. In the past attempts were made to improve local sheep by crossing with wool breeds from Australia. These attempts were on a small scale and did not meet with much success.

Speaking generally it may be said that Ceylon is not a sheep country."

Mr. Perera also read the following extract from a note by the Deputy Director (Veterinary):—

"I am firmly of the opinion that speaking generally Ceylon is not a sheep country. In most parts the rainfall is much too heavy for sheep and the temperature far too high for wool production. Dry climates are those in which sheep thrive best. When I say that the temperature in Ceylon is too high for sheep I am sure I will be told that in such places as Australia, South Africa and Mysore the temperature is often higher than in Ceylon. That is so but the temperature is not constantly high. There are cold frosty seasons and cold nights in all these places and none of them have a humidity approaching that of Ceylon. You cannot produce wool in a country where the temperature is hot and the atmosphere humid all the year round as it is in the greater part of Ceylon.

The only type of sheep native to Ceylon is a hairy sheep, not a woolled sheep.

Small hairy sheep for mutton production can be reared in the drier parts of Ceylon such as Mannar, Batticaloa and Chilaw Districts.

The demand for sheep mutton, however, is much less than for goat mutton in Ceylon.

The rate of increase of sheep is much slower than that of goats. For most districts goats are a more profitable proposition than sheep in Ceylon.

I would most strongly advise against any importation of Merino sheep, they are doomed to failure.

Mr. Sturgess many years ago tried breeding sheep imported from Australia and crossed with local sheep but results were poor.

The Patna lands at first sight always impress one as possible sheep country. I feel that sheep might do on the Patna lands, if we get a hardy mutton type, not a long woolled type such as the Merino but even with such a type I feel that the very heavy rainfall of the South West monsoon will be too much for sheep.

Old planters tell me that sheep have been tried on the Patnas in the past but losses from pneumonia were too heavy . . . . . "

Sir James P. Obeysekera suggested that that resolution might be altered to deer farming instead of sheep farming. He felt that it was better to back up and improve upon indigenous resources instead of trying to import sheep and carry out experiments. There were thousands of deer available in the Island and venison was more palatable than mutton. As they already knew that the deer could stand the climate and that they could domesticate those animals it was very easy to bring up a herd.

Mr. R. T. Chelliah said that in Jaffna sheep farming was not done on a business scale but each farmer owned 10 or 12 sheep and that there was no record of how many of them died due to unsuitable weather.

Mr. Coomaraswamy said that sheep do thrive on coconut estates but when they multiply, due to lack of fodder, at the first blast of the drought, they die. As a result, in Jaffna, they did not have more than a couple of hundred sheep.

Mudaliyar Abulcassim Maraikar said that sheep farming was definitely going on in Mannar District but it was only during the dry season, and during the wet season there was an outbreak of some disease or other, and the whole herd was completely destroyed.

Major de Fonseka inquired at this stage whether that resolution could not be moved with an amendment that " The Board might go into the matter and advise whether sheep-farming was possible in Ceylon ".

The Chairman replied that from the discussions that ensued it was quite clear that even in places like Jaffna and Mannar it was not a possibility since sheep could not stand even that amount of wet weather, therefore he did not favour the suggestion.

The motion was put to the house and lost.

V. Item 4 on the Agenda, two resolutions to be moved by Gate Mudaliyar N. Wickremaratne were put off for the next meeting as Mudaliyar Wickremaratne had by that time left the meeting owing to indisposition.

VI. EXECUTIVE COMMITTEE OF THE C.B.A.

Item 5 on the Agenda was next taken up and a letter from Gate Mudaliyar N. Wickremaratne to the Permanent Secretary, Ministry of Agriculture and Lands regarding the Executive Committee of the Board was tabled.

The Chairman said that under the existing rules of the Board, not more than 10 members, in addition to the Director of Agriculture who should be Chairman should form the Executive Committee and therefore the Board was compelled to have an Executive Committee unless the Ministry decided to alter the rules.

VII. The next meeting of the Board was fixed for November 14, 1949.

VIII. The meeting terminated at 5 p.m. with a vote of thanks to the Chair proposed by Rev. Fr. Wickremasinghe and seconded by Major E. C. de Fonseka.

H. E. S. Ranasinghe,
Secretary, Central Board of Agriculture.

Peradeniya, August 22, 1949.

Coconut Research Scheme (Ceylon)
Board of Management

DRAFT MINUTES OF THE 106th MEETING OF THE BOARD OF MANAGEMENT, COCONUT RESEARCH SCHEME, HELD AT 10 A.M. ON WEDNESDAY DECEMBER 21, 1949, AT THE PLANTERS' ASSOCIATION OF CEYLON, 113, STEUART PLACE, COLPETTY

Present.—D. Rhind, Esq., O.B.E. (Director of Agriculture and Chairman); H. E. Peries, Esq. M.B.E., C.C.S. (Treasury Representative); T. Amarasuriya, Esq. (Chairman, Low Country Products' Association); C. E. L. de Silva, Esq. (representing the L.C.P.A.); Col. W. G. Mack, O.B.E., E.D. (representing the Planters' Association); C. A. M. de Silva, Esq. (representing the Small-holders); G. Panditteseker a, Esq., J.P., U.M. (representing the Small-holders); N. H. Keerthiratne, Esq., M.P. (representing the House of Parliament); Albert F. Peries, Esq., J.P., U.M., M.P. (representing the House of Parliament), Mr. F. C. Cooke (Director, Coconut Research Scheme); Mr. S. C. Kahawita, (Secretary-Accountant, C.R.S.).

1. MINUTES

The minutes of the previous meeting held on November 5, 1949, which had been circulated were confirmed without amendment.

2. CORRESPONDENCE

(*a*) A letter from the Hon. Minister of Finance authorizing Mr. H. E. Peries, C.C.S., to attend the 106th Meeting of the Board in the absence of Mr. T. D. Perera, the Treasury Representative, was tabled.

(*b*) *Field Day at Bandirippuwa Estate.*—A letter from the Secretary to the Minister for Agriculture and Lands informing that the Rt. Hon. the Prime Minister has been pleased to accept the invitation to open the Field Day on Saturday, March 18, 1950, was tabled. An estimate of expenditure for this was to be made and placed before the Board early.

3. The Chairman informed the Board that he has been notified that the Government intends giving the C.R.S. a grant of Rs. 170,000 to carry on for six months, pending a Cabinet decision of the Coconut Commission Report and the increase of the cess to five times, previously proposed, has been deferred.

The Treasury representative informed the Board that the money has been already passed and will be received by the Scheme in a few days' time.

4. APPOINTMENT OF A TYPIST CLERK

The Board, while approving the appointment of Mr. Victor Yesudian as the Typist Clerk to the Replanting Division, gave sanction to the employment of a Temporary Clerk at Rs. 3 per diem as from May 16, 1949.

Student Trainees.—An application to pursue a course of training at the C.R.S. was tabled. The Board was of opinion that the course of training should be for at least 6 months, and the course should be given in the Coconut Research Scheme. The course should be decided by the Dirctor and should include both practical and theoretical. After the satisfactory conclusion of the course the student should be given a certificate.

5. ADVISORY VISITS

The Director read out a leaflet he proposed to have printed and distributed among the owners of estates who require more advice than the Coconut Research Scheme officers could give. The leaflet was approved by the Board. It was proposed and agreed that the contents of the leaflet should be communicated to the Press.

6. The Chairman informed the Board that the Director wished to place certain facts before the Board in order to have them recorded. The Board agreed to this and the Director said that since his arrival a state of chronic indebtedness had developed and even necessary expenditure has had to be cut out. The appreciable increase in the cess recently recommended by all the planting bodies, which received the approval of the Treasury, is apparently not to be implemented. Instead there is a vague proposal for some sort of financial provision to tide the Scheme over the next six months with no real assurance that at the end of this period the position will be any better.

On a former occasion, adequate financial provision for capital and recurrent expenditure received Ministerial approval but a change of government cancelled the arrangement. Similarly the latest proposals may prove unacceptable to the House or an economic crisis may intervene and lead to the total cancellation of our proposals for reorganization.

To make matters worse, when funds are finally made available, the Acting Chemist has to be sent to the U.K. to broaden his knowledge and the Acting Botanist for further training, but they cannot go until Research Assistants have been appointed and trained. While they are away it will simply be a case of carrying on current investigations. With all these delays there is every prospect that little new work can be initiated during the period of his current agreement, viz., 3 years.

He therefore wished to register a formal protest that the long continued absence of a stable and assured income and adequate provision for capital expenditure is seriously inhibiting the work of this Institute and that he can accept no responsibility for any shortcomings or failure to " Deliver the Goods ".

Rubber Research Scheme (Ceylon)

MINUTES OF THE NINETY-SIXTH MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE CEYLON CHAMBER OF COMMERCE BUILDING, COLOMBO, AT 2.30 P.M. ON FRIDAY, NOVEMBER 4th, 1949

Present.—Mr. D. Rhind, O.B.E. (in the chair); Dr. E. Phillis, D.Sc., Ph.D. (Director, R.R.S.); Mr. T. D. Perera, C.C.S. (Deputy Secretary to the Treasury); Mr. H. J. Cole Bowen; Mr. F. H. Griffith, M.P.; Major M. Jayewickrema, M.P.; Mr. F. A. Obeyesekera; Mr. J. L. D. Peiris, and Senator C. Wijesinghe.

1. MINUTES

Draft minutes of the meeting held on October 22/23, 1949, which had been circulated to members, were signed by the Chairman on signification of members' assent that they were in order.

2. REPORTS AND ACCOUNTS

(*a*) *Draft Estimates of Income and Expenditure for 1950.*—Draft estimates for 1950, providing for income and expenditure as follows, were considered and approved—

	Rs.	*Rs.*
Estimated income	..	1,065,541
Estimated expenditure :		
On Revenue Account	738,776	
On Capital	98,172	.. 836,948
Estimated excess of income over expenditure	..	228,593

(*b*) *Estate accounts for July and August 1949*—were tabled.

(*c*) *Investments.*—1. Reported withdrawal of a fixed deposit of Rs. 100,000 on maturity and investment thereof in 3 per cent. Sri Lanka Government Loan, 1969/74.

2. Agreed that a further sum of Rs. 150,000 be invested in long-term securities in accordance with the advice of the Treasury representative.

3. STAFF

Changes in junior staff were reported.

4. PUBLICATIONS

(*a*) The Combined Quarterly Circular for 1948 was tabled.

(*b*) *Publications for ex-Board Members.*—Agreed that current publications may be issued free of charge at the Director's discretion to former Board members who apply for them.

5. CHAIRMANSHIP

The Chairman informed the Board that the Hon. the Minister of Agriculture and Lands had decided that the Board should in future elect its own non-official Chairman.

6. EXCHANGE OF PLANTING MATERIAL WITH MALAYA

The Chairman reported that the Government of Malaya had recently prohibited the export of planting material of all economic crops. As this was holding up the exchange of budwood with the R.R.I., Malaya, it was agreed that the Minister for Agriculture and Lands be requested to seek an interim agreement with the Government of Malaya for the exchange of rubber planting material.

The meeting terminated with a vote of thanks to the Chair.

Dartonfield,
Agalawatta, November 25, 1949.

C. D. DE FONSEKA,
Secretary-Accountant.

Rubber Research Scheme (Ceylon)

MINUTES OF THE NINETY-SEVENTH MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE PLANTERS' ASSOCIATION HEADQUARTERS, COLOMBO, AT 2.30 P.M. ON FRIDAY, DECEMBER 16, 1949

Present.—Mr. D. Rhind, O.B.E. (in the chair); Dr. E. Phillis, D.Sc., Ph.D. (Director, R.R.S.); Mr. H. E. Peries, C.C.S. (Controller of Finance and Supply); Mr. F. H. Griffith, M.P.; Mr. F. A. Obeyesekera; Mr. J. L. D. Peiris, and Senator C. Wijesinghe.

1. MINUTES

(*a*) *Signing.*—Draft minutes of the meeting held on November 4, 1949, which had been circulated to members, were signed by the Chairman on signification of members' assent that they were in order.

(*b*) *Matters arising from the minutes*—

Experimental Committee.—The nomination of Mr. Errol Jayewickrema to serve on the Committee representing the Southern Province was accepted.

2. BOARD

The Chairman reported that:

(*a*) Senator C. Wijesinghe had been re-nominated to represent the Senate for three years from November 1, 1949.

(*b*) Mr. H. St. J. Cole Bowen had tendered his resignation with effect from January 1, 1950, and Mr. R. J. Hartley had been nominated in his place to represent the Agency Section of the Planters' Association of Ceylon.

(*c*) Mr. H. E. Peries, C.C.S., had been deputed by the Hon. the Minister of Finance to attend this meeting instead of Mr. T. D. Perera, C.C.S.

3. REPORTS AND ACCOUNTS

(*a*) Statement of Receipts and Payments for the 3rd quarter 1949—was approved.

(*b*) Estate accounts for September 1949—were tabled.

(*c*) Investments—The Chairman reported that a sum of Rs. 150,000 had been invested in Sri Lanka Government 3 per cent. Loan 1969/74 in accordance with the advice of the Deputy Secretary to the Treasury. This was approved.

4. DISPLAY OF CLONAL RUBBER SAMPLES

Samples of crepe prepared from various clones showing the variations in colour were examined with interest by members.

5. PUBLICATIONS

The Annual Report for 1948 was tabled.

6. DISCOLORATION OF CREPE RUBBER

Action taken to advise rubber producers regarding discoloration of crepe rubber was reported and it was understood that no complaints had been received since the issue of the Scheme's circular on the subject.

Dartonfield,
Agalawatta, January 5, 1950.

C. D. DE FONSEKA,
Secretary-Accountant.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED OCTOBER 31, 1949

Province	Disease	Fresh cases during the month	Cases up to date since Jan. 1, 1949	From Jan. 1, 1949 to Oct 31, 1949			
				Deaths	Recoveries	Balance ill	No. shot
Western Province	Foot-and-mouth	—	1,007	8	999	—	—
	Rabies	—	1	1	—	—	—
	Piroplasmosis	—	1	1	—	—	—
Colombo Municipality	Foot-and-mouth	—	327	—	327	—	—
	Rabies	7	36	36	—	—	—
Quarantine Station	Anthrax in sheep and goats	3	88	88	—	—	—
	Foot-and-mouth	—	12	—	12	—	—
Northern Province	Foot-and-mouth	—	920	18	902	—	—
	Anthrax	—	385	385	—	—	—
	Rabies	6	8	8	—	—	—
	Black Quarter	—	17	17	—	—	—
North-Central Province	Foot-and-mouth	—	2,427	2	2,425	—	—
North-Western Province	Foot-and-mouth	1	1,109	322	4,787	—	—
Central Province	Mange (cattle)	106	206	—	98	108	—
	Rabies	—	8	8	—	—	—
	Piroplasmosis	—	2	—	2	—	—
	Foot-and-mouth	—	500	—	499	—	1
Sabaragamuwa Province	Foot-and-mouth	85	85	—	78	7	—
	Piroplasmosis	—	10	3	7	—	—
	Rabies	1	7	3	—	—	4
Uva Province	Rabies	—	1	1	—	—	—
	Black Quarter	—	8	8	—	—	—
Eastern Province	Black Quarter	—	12	12	—	—	—
Southern Province	Rabies	—	10	1	—	—	8

P. G. MALKANTI,
Ag. Deputy Director (Animal Husbandry),
and Government Veterinary Surgeon.

Peradeniya, January 24, 1950.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED NOVEMBER 30, 1949

Province	Disease	Fresh Cases during the month	Cases up to date since Jan. 1, 1949	From Jan. 1, 1949 to Nov. 30, 1949			
				Deaths	Recoveries	Balance ill	No. shot
Western Province	Foot-and-mouth	—	1,007	8	999	—	—
	Rabies	—	1	1	—	—	—
	Piroplasmosis	—	1	1	—	—	—
Colombo Municipality	Foot-and-mouth	—	327	—	327	—	—
	Rabies	8	64	64	—	—	—
Quarantine Station	Anthrax (in sheep and goats)	—	88	88	—	—	—
	Foot-and-mouth	—	12	—	12	—	—
Northern Province	Foot-and-mouth	25	945	18	915	12	—
	Anthrax	48	433	426	7	—	—
	Rabies	3	11	11	—	—	—
	Black Quarter	—	17	17	—	—	—
North-Central Province	Foot-and-mouth	—	2,427	2	2,425	—	—
	Rabies	1	1	—	—	—	1
North-Western Province	Foot-and-mouth	18	5,127	324	4,793	10	—
	Rabies	1	1	—	—	—	1
Central Province	Mange (cattle)	108	314	—	225	89	—
	Rabies	—	8	8	—	—	—
	Piroplasmosis	1	3	—	3	—	—
	Foot-and-mouth	—	500	—	499	—	1
Sabaragamuwa Province	Piroplasmosis	—	10	3	7	—	—
	Foot-and-mouth	6	91	—	85	6	—
	Rabies	1	7	2	—	—	5
Uva Province	Rabies	—	1	1	—	—	—
	Black Quarter	—	8	8	—	—	—
Eastern Province	Black Quarter	13	25	25	—	—	—
Southern Province	Rabies	—	10	1	—	—	9

Peradeniya, January 24, 1950.

A. W. R. JOACHIM,
for Acting Deputy Director (Animal Husbandry)
and Government Veterinary Surgeon.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED DECEMBER 31, 1949

Province	Disease	Fresh Cases during the month	Cases up to date since Jan. 1. 1949	From Jany. 1, 1949 to Dec. 31, 1949			
				Deaths	Recoveries	Balance ill	No. shot
Western Province	Foot-and-mouth	—	1,007	8	999	—	—
	Rabies	—	1	1	—	—	—
	Piroplasmosis	—	1	1	—	—	—
Colombo Municipality	Foot-and-mouth	18	345	—	345	—	—
	Rabies	14	78	78	—	—	—
Quarantine Station	Foot-and-mouth	—	12	—	12	—	—
	Anthrax (in sheep and goats)	10	98	98	—	—	—
Northern Province	Foot-and-mouth	675	1,620	68	1,492	60	—
	Anthrax	1	434	427	7	—	—
	Rabies	1	12	12	—	—	—
	Black Quarter	—	17	17	—	—	—
North-Central Province	Foot-and-mouth	—	5,127	324	4,793	10	—
	Rabies	—	1	—	—	—	1
North-Western Province	Foot-and-mouth	—	5,127	325	4,794	8	—
	Rabies	1	2	1	—	—	—
Central Province	Mange (cattle)	200	514	—	514	200	—
	Rabies	—	8	8	—	—	—
	Piroplasmosis	—	3	—	3	—	—
	Foot-and-mouth	—	500	—	499	—	1
Sabaragamuwa Province	Piroplasmosis	—	10	3	7	—	—
	Rabies	1	8	2	—	—	6
	Foot-and-mouth	—	91	—	91	—	—
Uva Province	Rabies	1	2	2	—	—	—
	Black Quarter	—	8	8	—	—	—
Eastern Province ..	Black Quarter	—	25	25	—	—	—
Southern Province ..	Rabies	—	10	1	—	—	9

A. W. R. JOACHIM,
for Acting Deputy Director (Animal Husbandry)
and Government Veterinary Surgeon.

Peradeniya, January 25, 1950.

4—J. N. A 95638 (2/50)

METEOROLOGICAL REPORT, OCTOBER, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	86·0	+0·3	72·4	0	85	98	6·0	24·73	20	+ 5·97
Anuradhapura	89·0	0	74·0	+0·5	74	93	6·2	10·95	15	+ 1·23
Badulla	82·7	—0·1	65·6	+0·1	76	95	6·2	8·56	16	— 0·33
Batticaloa	87·6	+0·6	75·6	+0·4	75	88	6·4	4·16	10	— 3·03
Colombo	85·3	+0·3	76·1	+1·3	79	88	6·2	13·04	16	— 0·67
Diyatalawa	75·7	—0·6	60·9	—0·3	77	91	6·4	4·11	22	— 5·07
Galle	83·0	—0·1	76·5	—1·1	83	88	6·4	9·35	16	— 2·70
Hakgala	69·5	—0·6	56·8	—0·7	85	91	5·8	7·03	19	— 4·25
Hambantota	87·3	+1·1	76·2	+1·0	76	88	5·8	1·73	8	— 3·03
Jaffna	86·4	+0·6	78·3	+0·8	78	84	6·0	5·60	10	— 3·60
Kandy	84·2	—0·1	69·2	+0·7	76	92	6·2	7·31	23	— 3·23
Kurunegala	86·6	—0·9	73·9	—0·7	71	84	5·6	5·63	20	— 9·23
Lunuwila	85·4	—0·3	75·5	+1·3	—	93	—	10·58	18	— 0·31
Mannar	87·0	0	77·0	—0·2	78	88	6·6	4·80	9	— 1·78
Nuwara Eliya	67·4	—0·3	52·5	+0·7	84	91	6·2	6·39	22	— 3·37
Puttalam	86·1	—0·2	76·8	—1·3	77	88	6·3	5·80	12	— 1·63
Ratnapura	86·7	—0·4	72·7	—0·1	83	95	6·2	25·30	22	+ 7·29
Talawakele	72·1	—1·4	57·6	—0·1	86	97	5·4	10·80	20	+ 0·74
Trincomalee	89·3	+1·5	76·3	—0·8	73	86	6·0	4·13	10	— 5·42

WEATHER SUMMARY, OCTOBER, 1949

In October too the rainfall was below normal, except on the south-western slopes of the hills and in the mid-country to south of that, where it was appreciably above normal. The greatest excesses were 11.37 inches at Luccombe Estate, 9.82 inches at Norton Bridge and 9.57 inches at Maliboda Estate.

The larger deficits (of the order of 5 to 10 inches) occurred around Trincomalee, in the Districts of Kandy and Kurunegala, and on the north-eastern and south-eastern slopes of the hills. The largest deficits were 10.75 inches at Kobonella Estate, 10.44 inches at Rambukkana, 10.36 inches at Deanstone Estate and 10.30 inches at Udugama.

Rainfall was heaviest on the south-western slopes of the hills and in the neighbourhood of Ratnapura, where several stations recorded totals over 25 inches, outstanding amounts being 34.44 inches at Weweltalawa Estate, 34.28 inches at Maliboda Estate, 33.98 inches at Norton Bridge, 32.87 inches at Dabar Estate and 32.45 inches at Padupola. Outside the south-western quarter monthly totals generally ranged from 5 to 10 inches, while at the coastal stations in the east, south-east and north-west they were below 5 inches.

The month started with widespread rain accompanied by thunder, a number of stations along the west coast recording amounts over 3 inches on the 1st Madampe area experienced the heaviest falls, 10.50 inches at Ratmalagara Estate, and 8.23 inches at Karukkuwa Estate. There was a marked decrease in rainfall during the next few days, but south-west monsoon conditions strengthened again from the 7th and lasted for about five days. Thunder activity which became evident thereafter was widespread on the 14th.

Due to a depression in the Bay of Bengal weather became unsettled from the 21st, and considerable rain in the south-western parts of the Island and squally weather were experienced till about the 28th. During the last few days of the month thunder activity with fairly widespread rain was again in evidence.

There were 34 daily falls over 5 inches, most of them occurring on the 1st, 8th or 25th. The highest was 10.50 inches at Ratmalagara Estate on the 1st.

Day temperatures were generally above normal at coast stations and below normal elsewhere, while night temperatures were mostly above normal. The highest temperature recorded was 94.2° at Anuradhapura on the 1st. The lowest temperature for low country stations was 68.0° at Ratnapura on the 12th, while the lowest temperature recorded was 44.7° at Nuwara Eliya also on the 12th. Humidities were above average by day and below average by night. The skies were more cloudy than usual. The winds were slightly above the average strength, the prevailing direction being south-westerly.

D. T. E. DASSANAYAKE,
Director.

METEOROLOGICAL REPORT, NOVEMBER, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	87·5	+1·1	71·1	—0·5	91	98	4·6	13·38	16	— 5·14
Anuradhapura	86·0	+0·3	70·7	—1·0	76	95	5·6	9·92	17	— 0·75
Badulla	78·7	—0·6	65·0	—0·5	82	97	5·8	11·83	20	+ 1·58
Batticaloa	84·2	+0·1	74·4	+0·1	78	90	6·6	11·97	16	— 1·89
Colombo	86·4	+1·2	73·5	+0·1	74	93	4·6	9·70	13	— 3·39
Diyatalawa	73·2	—0·8	57·4	—2·7	84	97	6·5	8·09	21	— 2·33
Galle	84·7	+1·3	74·0	—0·3	80	93	5·9	7·52	12	— 4·49
Hakgala	67·4	—1·3	54·2	—0·9	89	94	5·2	10·64	18	— 1·69
Hambantota	85·8	+0·6	73.9	—0·1	82	90	6·1	3·84	17	— 3·73
Jaffna	84·6	+0·7	74·1	—0·7	76	93	5·4	11·94	17	— 5·33
Kandy	84·6	+0·7	68·3	+0 2	76	90	5·4	10·65	20	— 0·37
Kurunegala	87·4	+0·4	71·6	—0·4	73	90	4·4	7·46	19	— 4·93
Mannar	84·7	+0·1	76·0	+0·4	78	86	5·6	4·57	17	— 5·62
Nuwara Eliya	67·4	—0·3	51·0	—0·3	80	88	6·0	6·69	18	— 2·50
Puttalam	86·8	+1·2	72·4	—0·9	76	93	5·4	2·80	12	— 7·33
Ratmalana	86·4	—	72·4	—	75	93	5·2	12·10	12	—
Ratnapura	89·1	+1·7	72·2	—0·2	80	95	6·3	7·95	16	— 6·84
Talawakele	73·9	+0·3	56·9	—0·4	76	88	4·8	8·24	18	— 0·26
Trincomalee	82·9	—0·7	75·0	+0·2	82	90	6·2	12·88	16	— 1·06

WEATHER SUMMARY, NOVEMBER, 1949

In November again the rainfall was below normal over a large portion of the Island. The bigger deficits (of the order of 5 to 10 inches) occurred in the Northern and North-Western Provinces and in the south-western low and mid-country, the highest being 13.21 inches at Udugama, 11.01 inches at Sunderland Estate, 10.84 inches at Hanwella and 10.47 inches at Baddegama Estate.

In some parts of the Northern and North-Western Provinces rainfall had been continuously in deficit during the last three months, and as these regions receive a fair portion of the year's rainfall during October and November the aggregate deficits experienced were comparatively high. Thus, the rainfall recorded at Kanukkeni in the Mullaittivu area during the three months was only 13.6 inches against an average of 27.9 inches. Corresponding figures for Nedunkeni were 16.2 inches against 28.5 inches. Similarly in the North-Western Province, the rainfall recorded at Kurunegala was only 15.4 inches against an average of 32.8 inches and at Giriulla 17.7 inches against 32.4 inches. Corresponding figures for Chilaw were 11.0 inches against 22.7 inches, and for Wariyapola 13.8 inches against 29.1 inches.

Excesses in November occurred chiefly on the north-eastern slopes of the hills and the adjacent mid-country, the highest being 15.6 inches at Horaborawewa, 12.95 inches at St. Martin's (Upper) Estate and 11.69 inches at Dooroomadella Factory.

The region of heavy rain moved on to the north-eastern slopes of the hills in November, indicative of the setting in of the north-east monsoon, and several stations in this area recorded monthly totals over 20 inches, the highest being 35.83 inches at St. Martin's (Upper) Estate, 32.85 inches at Hendon Estate, 30.61 inches at St. Martin's (Lower) Estate and 30.28 inches at Dooroomadella Factory. Elsewhere over the Island the rainfall generally ranged from five to fifteen inches. Least rain was experienced along the north-west coast and at some stations in Kurunegala, Matara and Hambantota Districts where the monthly totals were below 5 inches.

There were 18 daily falls of five inches or over in November, the highest being 7.50 inches at Thumpenkeni on the 25th, 7.30 inches at Pimbura on the 18th and 6.67 inches at Elephant Pass on the 4th.

Thunder activity during the latter part of October extended into November, resulting in fairly widespread rain during the first week. This was followed by a spell of dry weather from the 8th to 13th, after which thunderstorms were in evidence again. From about the 20th north-east monsoon conditions were experienced over the Island, with monsoon rain in the north-eastern parts and evening thundershowers on the lee side.

A wave of unusually cold dry weather swept across the Island on the 23rd when the night temperatures fell considerably below normal. The minimum at Nuwara Eliya on the 24th went down as low as 34.5°F, seventeen degrees below the average for November. Hardly any rain was recorded in Ceylon during these two days. Monsoon rain was again in evidence during the last few days of the month.

Day temperatures were below normal on the north-east side and appreciably above normal in the south-west, while night temperatures were on the whole slightly below normal. The highest shade temperature recorded was 93.4°F at Ratnapura on the 16th, while the lowest temperature for a low-country station was 64.1°F at Anuradhapura on the 10th. The lowest temperature for the whole Island was 34.5°F at Nuwara Eliya on the 24th. Humidity and cloud amounts were irregular, while the wind strength was about average.

D. T. E. DASSANAYAKE,

METEOROLOGICAL REPORT, DECEMBER, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	86·5	—0·8	70·7	—0.4	86	95	5·8	6·44	12	— 4·19
Anuradhapura	82·0	—1.1	69·0	—1·3	79	95	6·3	7·79	13	+ 0·27
Badulla	74·1	—2·7	64·7	+0·2	88	94	6·0	16·18	24	+ 4·95
Batticaloa	80·2	—1·7	73·8	+0·2	82	88	7·2	33·17	20	+16·18
Colombo	85·4	—0·1	71·3	—1·1	76	95	5·4	3·35	6	— 2·26
Diyatalawa	69·1	—3·0	59·4	+0·8	88	97	7·1	13·90	21	+ 5·83
Galle	82·8	—0·8	73·0	—0·4	84	95	6·5	9·53	14	+ 1·71
Hakgala	—	—	—	—	—	—	—	15·25	21	+ 2·24
Hambantota	83·6	—0·9	73·2	+0·2	80	90	6·7	7·28	15	+ 1·67
Jaffna	82·6	+0·2	72·5	—0·6	73	88	5·6	3·24	9	— 7·15
Kandy	81·2	—2·0	67·6	+0·3	80	92	6·7	10·23	16	+ 1·79
Kurunegala	83·6	—2·3	71·2	+0·4	76	90	6·0	4·54	14	— 2·24
Mannar	81·9	—0·8	74·6	—0·2	77	84	6.2	10·35	10	+ 2·56
Nuwara Eliya	66·6	—1·2	51·7	+2·9	78	88	6·8	9.35	18	+ 1·54
Puttalam	84·7	0	70·2	—1·1	76	93	6·2	1·92	9	— 3·63
Ratmalana	86·2	—	70.9	—	72	90	6·0	5·60	8	—
Ratnapura	86·7	—1·2	71·4	—0·4	80	95	7·0	7·26	16	— 1·86
Talawakele	72·2	—1·4	57·2	+1·0	76	82	5·4	7·03	14	+ 1·85
Trincomalee	79·7	—1·4	75·6	+1·0	82	84	6·8	32·08	19	+19·08

WEATHER SUMMARY, DECEMBER, 1949

In December, 1949 (as in the corresponding month of the previous year), very heavy rain was experienced in the Eastern Province and on the north-eastern slopes of the hills, a number of stations recording monthly totals over 30 inches. Largest aggregates occurred in the Nitre Cave District, St. Martin's (Lower) Estate recording 62.46 inches, Hendon Estate 61.05 inches and St. Martin's (Upper) Estate 60.23 inches. Other stations which totalled over 40 inches were Forest Hill Estate, Timitar Estate, Dooroomadella Factory, Rufuskulam and Lugal Oya Estate. Rainfall decreased towards the west and least rain was experienced in the North-Western Province where monthly totals were below 5 inches.

As a result of this heavy precipitation, monthly aggregates were appreciably above normal in the eastern and north-eastern parts, largest excesses occurring in the Batticaloa District where the rainfall was more than 15 inches above average. Outstanding excesses were 32.04 inches at Timitar Estate, 29.73 inches at St. Martin's (Lower) Estate and 28.66 inches at Rufuskulam. Deficits occurred in the western and south-western parts of the Island and in the extreme north, the area worst affected being Jaffna Peninsula where the recorded rainfall was less than a third of the average. Largest deficits were 8.68 inches at Kayts, 7.85 inches at Jaffna Farm School and 7.62 inches at Kankesanturai.

There were 85 daily falls over 5 inches in December, the highest being 12.71 inches at Trincomalee on the 17th.

A hailstorm was reported near Adam's Peak on the 26th.

At the beginning of the month some monsoon rain was experienced in the eastern parts. This was followed by fairly heavy widespread rain on the 6th and 7th, caused by the passage of a low pressure wave across the Island. Bright and dry weather which set in immediately thereafter lasted about a week. Generally light rain, mainly in the eastern parts, was experienced from about the 15th, but the weather became markedly unsettled on the north-east coast on the 17th when as much as 12.71 inches of rain were recorded at Trincomalee and 11.05 inches at Andankulam. Due to the passage of another low pressure wave, fairly heavy widespread rain was again experienced in the eastern and north-eastern parts on the 25th and 26th.

Day temperatures were appreciably below normal, except in the extreme north and along the west coast, while night temperatures were on the whole slightly above normal. The highest temperature recorded in the shade was 91.1° at Ratnapura on the 15th, while the lowest temperature for a low-country station was 60.8° at Anuradhapura on the 13th. The lowest temperature for the whole Island was 35.4° at Nuwara Eliya, also on the 13th. Skies were more cloudy than usual and humidities were above average. Wind strength was above normal, the prevailing direction being north-easterly.

D. T. E. DASSANAYAKE,
Director.

List of New Acquisitions to the Library, Department of Agriculture, for the Period October 1, 1949, to December 31, 1949

BOOKS

1. Darlington and Mather—The Elements of Genetics.
2. The Crisis of Mankind.
3. Michals, C. A.—Systematic Laboratory Studies of Field Crop and Weeds.
4. Taylor—Tobacco Culture.
5. Lyon and Buckman—The Nature and Properties of Soils 4th Edition. (Issued to Principal, Girls' Farm School, Kundasale.)
6. Barger and Card—Diseases and Parasites of Poultry. 4th Edition.
7. Legislative Enactments of Ceylon Vol I., 1941, Supplement.
8. Report of Marketing Castor Oil Seeds in India, 1937.
9. Agricultural Produce. (Grading and Marketing Act.)
10. Fream—Elements of Agriculture, 13th Edition.
11. Williams—Principles of Agriculture.
12. Stapledon and Davies—Ley Farming. Revised Edition.
13. Darlington and Mather—The Elements of Genetics. (Issued to A.R.O., Maha Illuppallama.
14. Snowden—The Cultivated Races of Sorghum. (Issued to A.R.O., M.I.)
15. Patel—The Coconut. (Issued to Principal. G.F.S., K.)
16. Richaria—Plant Breeding and Genetics in India. (Issued to Botanist.)
17. Richaria—Plant Breeding and Genetics in India.
18. Fisher—The Theory of Inbreeding.
19. Bier—Some Common Tree Diseases of British Columbia.
20. Kearney and Peebles—Flowering Plants and Ferns of Arizona.
21. Nichols—Livestock Improvement, 3rd Edition. (Issued to Principal, G.F.S., K.)
22. Newton—Recent Advances in Physiology, 7th Edition. (Issued to V.R.O.)
23. Goldschmidt—Bridle Wise, 2nd Edition. (Issued to V.R.O.)
24. Schopper—Plants and Vitamins. (Issued to A.R.O., M.I.)
25. Deraniyagala—Some Vertebrate Animals of Ceylon, Vol I.

PERIODICALS

1. Agriculture Pakistan.
2. American Journal of Pathology.
3. Canadian Coarse Grains Quarterly Review.
4. East Punjab Farmer.
5. Indian Academy of Sciences Proceedings—Section A.
6. Indian Academy of Sciences Proceedings—Section B
7. Journal of Infectious Diseases.
8. Mauritius Department of Agriculture—Leaflets
9. Mysore Economic Review.
10. Needlework Illustrated.
11. Plant Disease Reporter.
12. Plant Disease Supplement.
13. Practical Needlework.
14. Rice Journal.
15. University of Arizona Bulletins.
16. Utah State Agricultural College Circulars.
17. Utah State Agricultural Special Reports.

5—J. N. A 95638 (2/50)